Signals & Systems

1) The Continuous System is described by $y(t) = x(t)^2$ is
   (a)causal, linear and time varying.
   (b)causal, non-linear and time varying.
   ©non causal, non-linear and time-invariant.
   (d)non causal, linear and time-invariant.✓
2) The impulse response of a system described by the differential equation
   $\frac{d^2y}{dt^2} + y(t) = x(t)$ will be
   (a) a constant.
   (b) an impulse function..
   (c) a sinusoid. ✓
   (d) an exponentially decaying function.

3)z-transform converts convolution of time-signals to
(A) addition.
(B)subtraction.
(C) multiplication. ✓
(D) division.

4) If the Fourier series coefficients of a signal are periodic then the signal must be

(A)continuous-time, periodic
(B)discrete-time, periodic✓
(C)continuous-time, non-periodic
(D)discrete-time, non-periodic

5) The region of convergence of a causal finite duration discrete -time signal is
(A)the entire z-plane except z=0✓
(B)the entire z-plane except z=∞
©the entire z-plane
(D)a strip in z-plane enclosing jω-axis

6) The property of Fourier Transform which states that the compression in time domain is equivalent to expansion in the frequency domain is
(A) Duality.
(B)Scaling.
(C)Time Scaling. ✓
(D) Frequency Shifting.

7)The Fourier Transform of a Gaussian pulse is _____ function
a)Impulse
b)Sinc
c)Gate

d)Gaussian ✓

8) Two sequences $x_1(n)$ & $x_2(n)$ are related by $x_2(n) = x_1(-n)$,In the Z-domain, their ROCs are

(A)same
(B) reciprocal of each other ✓
(C)negative of each other
(D) complement of each other

9) Which of the following is true for the system represented by $y(n) = x(-n)$

(A)Linear ✓
(B)Time invariant
(C)Causal
(D)Non Linear

10) Convolution is used to find

(A)amount of similarity between the signals
(B)response of the system
(C)multiplication of the signals✓
(D)Fourier transform

11) Correlation is used to find

(A)amount of similarity between the signals ✓
(B)response of the system
(C)multiplication of the signals
(D)Fourier transform

12) Discrete time system is stable if the poles are

(A)within unit circle ✓
(B)outside unit circle
(C)on the unit circle
(D)both B and C

13) The _____ operation recovers the input signal from output and system response.

a) Convolution

b) Auto-Correlation

c) Cross-Correlation

d) Deconvolution ✓

14) The _____ property of Fourier Transform depicts the energy of the signal.

a) Time Scaling

b) Time Shifting

c)Conjugate Symmetry

d)Parseval's Theorem.✓

15)_____ Transform is often used in transient and stability analysis of Continous Systems.

a) Fourier Transform

b) Laplace Transform

c) Z-Transform✓

d) DTFT

16)_____ System if the present value of the output signal depends on present or past values of input signal.

a)Invertible

b)Causal✓

c)Non-causal

d)Dynamic

17) _____ is the appropriate Fourier representation to analyse the Continuous Periodic Signal

a)Fourier Series✓

b)Fourier Transform

c)DTFS

d)DTFT

18) _____ is the appropriate Fourier representation to analyse the Continuous Non-Periodic Signal

a)Fourier Series

b)Fourier Transform✓

c)DTFS

d)DTFT

19) _____ is the appropriate Fourier representation to analyse the Discrete Periodic Signal

a)Fourier Series

b)Fourier Transform

c)DTFS✓

d)DTFT

20) _____ is the appropriate Fourier representation to analyse the Discrete Non-Periodic Signal

a)Fourier Series

b)Fourier Transform

c)DTFS

d)DTFT ✓

21)The Fourier Transform of constant A is given by

a)$2\pi A\delta(\omega)$✓

b) $2\pi\delta(\omega)$

c) $2A\delta(\omega)$

d) $2\delta(\omega)$

22)The Lapalce Transform of $u(t)$ is given by

a) $\frac{1}{s^2}$

b)$\frac{1}{s}$✓

c)$\frac{1}{s-3}$

d) 1

23) The Lapalce Transform of $tu(t)$ is given by

a) $\frac{1}{s^2}$✓

b)$\frac{1}{s}$

c)$\frac{1}{s-3}$

d) 1

24))_____ Transform is often used in transient and stability analysis of Discrete Systems.

a) Fourier Transform

b) Laplace Transform

c) Z-Transform

d) DTFT

25)The Z-Transform of $\delta[n]$ is _____.

a)$\frac{Z}{Z-a}$

b) $\frac{1}{Z}$

c) $\frac{1}{Z-a}$

d)1 ✓

26)The time reversal property of Z-Transform for $x[-n]$ is

a)$\frac{1}{X(Z)}$

b)$X\left(\frac{1}{Z}\right)$✓

c)$X(-Z)$

d) - $X(Z)$

27) The process of reconstructing a continuous time signal *x(t)* from its samples is known as

a)Decimation

b)Interpolation

c)Sampling✓

d)band limiting

28) The Fourier Transform of Signum function is

a)$\frac{1}{j\pi\omega}$✓

b) $j\pi\omega$

c)$j\omega$

d)$j\omega$

29) The Z-Transform of $u[n]$ is _____.

a)$\frac{Z}{Z-1}$✓

b) $\frac{1}{Z}$

c) $\frac{1}{Z-a}$

d)1

30) The Z-Transform of $nu[n]$ is _____.

a)$\frac{Z}{(Z-1)^2}$✓

b) $\frac{1}{Z}$

c) $\frac{1}{Z-a}$

d)1

31. The Fourier transform of a signal h t( ) is H j(ω)= (2 cosω)(sin2ω)/ ω. The value of h(0) is

(A) 1/ 4 (B) 1/ 2 (C) 1✓ (D) 2

32. For the system 2 /(s +1) , the approximate time taken for a step response to reach 98% of the final value is

(A) 1 s✓ (B) 2 s (C) 4 s (D) 8 s

33. The period of the signal x (t) = 8 sin(0.8πt + π/4) is

(A) 0.4π s (B) 0.8π s (C) 1.25 s (D) 2.5 s✓

34. A Linear Time Invariant system with an impulse response h (t) produces output y(t) when input x(t) is applied. When the input x (t – τ) is applied to a system with impulse response h(t – τ) , the output will be

(A) y(τ) (B) y(2(t – τ)) (C) y (t – τ) (D) y(t − 2τ)✓

35. A cascade of three Linear Time Invariant systems is causal and unstable. From this, we conclude that

(A) each system in the cascade is individually causal and unstable

(B) at least on system is unstable and at least one system is causal✓

(C) at least one system is causal and all systems are unstable

(D) the majority are unstable and the majority are causal

36. Which is following is correct Option

(A) All bounded periodic signals are power signals✓

(B) All signals are either energy and power signals

(C) All bounded aperiodic signals are power signals

(D) All bounded aperiodic signals are energy signals

37. The impulse response of a causal linear time-invariant system is given as h(t). Now consider the following two statements :

Statement (I): Principle of superposition holds

Statement (II): h(t) = 0 for t < 0

Which one of the following statements is correct ?

(A) Statements (I) is correct and statement (II) is wrong

(B) Statements (II) is correct and statement (I) is wrong

(C) Both Statement (I) and Statement (II) are wrong

(D) Both Statement (I) and Statement (II) are correct✓

38. A signal is processed by a causal filter with transfer function G(s) For a distortion free output signal wave form, G(s) must

(A) provides zero phase shift for all frequency

(B) provides constant phase shift for all frequency

(C) provides linear phase shift that is proportional to frequency✓

(D) provides a phase shift that is inversely proportional to frequency

39. The following is true

(A) A finite signal is always bounded

(B) A bounded signal always possesses finite energy

(C) A bounded signal is always zero outside the interval [-t,t] for some t.

(D) A bounded signal is always finite

40. The power in the signal $(t) = 8cos\ (20\pi t - \pi/2) + 4sin(15\pi t)\ is$

(a) 40✓ (b) 41 (c) 42 (d) 82

41. If a signal f(t) has energy E, the energy of the signal f(2t) is equal to

(a) E (b)E/2✓ (c) 2E (d)4E

42. For a periodic signal (t) = 30 sin $100t$ + 10 cos $300t$ + 6 sin$(500t + \pi$ 4), the fundamental frequency in rad/s is

(a) 100✓ (b) 300 (c) 500 (d) 1500

43. Trigonometric Fourier series of an even function of time does not have

(a) the dc term (b) cosine terms (c)sine terms✓
(d)odd harmonic terms

44. The trigonometric Fourier series of a periodic time function can have only

(a) cosine terms (b)sine terms (c) cosine and sine terms✓ (d)dc and cosine terms

45. The Fourier series of an odd periodic function, contains only

(a) odd harmonics (b) even harmonics (c) cosine terms (d)sine terms✓

46. The Fourier transform of a real valued time signal has

(a) odd symmetry (b) even symmetry (c) conjugate symmetry (d)no symmetry

47. A signal x(t) has a Fourier transform X(ω). If x(t) is a real and odd function of t, them X(ω) is

(a) a real and even function of ω

(b) an imaginary and odd function of ω

(c) an imaginary and even function of ω

(d) a real and odd function of ω✓

48. The Fourier transform of a conjugate symmetric function is always

(a) imaginary

(b) conjugate anti-symmetric

(c) real ✓

(d) conjugate symmetric

49. The amplitude spectrum of a Gaussian pulse is

(a) uniform (b) a sine function (c) Gaussian✓ (d)An impulse function

50. The Fourier transform of a voltage signal x(t) is X(f). The unit of $|(f)|$is

(a) Volt (b)Volt – sec✓ (c) Volt / sec
(d)Volt/min

51. Two of the angular frequencies at which its Fourier transform becomes zero are

(a) π, 2π✓ (b)0.5 π, 1.5 π (c) 0, π (d)2 π, 2.5

52. A bandlimited signal is sampled at the Nyquist rate. The signal can be recovered by passing the samples through

(a) an RC filter (b) an envelope detector (c) a PLL
(d) an ideal low-pass filter with the appropriate bandwidth✓

53. A signal has frequency components from 300 Hz to 1.8 KHz. The minimum possible rate at which the signal has to be sampled is ---

(a) 3600 samples/sec✓ (b) 360 samples/sec (c)300 samples/sec

(d) 3000 samples/sec

54. Flat top sampling of low pass signals

(a) gives rise to aperture effect✓ (b)implies oversampling
(c) leads to aliasing (d)introducing delay distortion

55. A 1.0 KHz signal is flat top sampled at the rate of 1800 samples/sec and the samples are applied to an ideal rectangular LPF with cut-off frequency of 1100 Hz, then the output of the filter contains (a) only 800 Hz component
(b)800 Hz and 900 Hz components (c) 800 Hz and 1000 Hz components✓ (d)800 Hz, 900 Hz and 100 Hz components

56. Four independent massages have bandwidths of 100 Hz. 100 Hz, 200 Hz and 400 Hz, respectively. Each is sampled at the Nyquist rate, and the samples

are Time Division Multiplexed (TDM) and transmitted. The transmitted rate (in Hz) is

(a) 1600✓ (b)800 (c) 400 (d)200

57. A system with an input x(t) and output y(t) is described by the relation: y(t) = t. x(t). This system is

(a) linear and time-invariant (b) linear and time-varying✓
(c) non-linear & time-invariant (d) non-linear and time-varying

58. A discrete-time signal $[n] = \sin(\pi\ 2\ n)$, n being an integer, is

(a) Periodic with period π (b) Periodic with period π 2
(c) Periodic with period π/2 (d) Not periodic✓

59. Convolution of $(t + 5)$ with impulse function $(t - 7)$is equal to

(a) $(t - 12)$ (b) $(t + 12)$ (c) $(t - 2)$✓ (d) $(t + 2)$

60. Two discrete time systems with impulse responses $h1\ [n] = [n - 1]$ and $h2\ [n] = [n - 2]$ are connected in cascade. The overall impulse response of the cascaded system is

(a) $[n - 1] + [n - 2]$ (b)$[n - 4]$ (c) $\delta[n - 3]$
(d)$\delta[n - 1]\ \delta[n - 2]$✓

61. Random signal can be modeled by
a. Differential equation b. Difference equation c. Statistical parameters✓ d. Integral

62. System with memory can be characterized by
a. Linear equation b. Differential equation c. Difference equation d. b and c ✓

63. Which system is non-causal?
a. y(t) = x(t+1)✓ b. y(t) = x(t-1) c. y(t) = x(t) + c d. y(t) = x(t-1) + c

64. The type of the system described by $y^2(t) + 2\ y(t) = x^2(t) + x(t) + c$ is
a. Linear and dynamic b. Linear and static
c. Non-linear and dynamic d. Non-linear and static✓

65. Tick the false statement.
    a. t δ(t) = 0 b. cos t δ(t-π) = - δ(t-π) c. δ(t) = $\int u(t)dt$ d. t δ(t) = - δ(t)✓

66. The product of two odd signals is an odd signal.
    a. True✓ b. False

67. Even part of the unit step signal is
    a. ½ b. 1 c. ½ sgn(t)✓ d. 0

68. Fourier series of any periodic signal x(t) can only be obtained if
    a. $\int_0^T |x(t)|dt < \infty$
    b. finite number of discontinuities within finite time interval t
    c. both (a) and (b)✓
    d. infinite number of discontinuities

69. Fourier spectrum (Transform) of non-periodic signal will have
    a. magnitude spectrum b. Phase spectrum c. both (a) and (b)✓ d. constant

70. If X(ω) is Fourier transform of a real signal x(t), then
    a. $|X(-\omega)| = |X(\omega)|$ b. ϕ(−ω) = −ϕ(ω)
    c. both (a) and (b) ✓ d. ϕ(−ω) = ϕ(ω)

71. Fourier transform of a d.c. signal with unity strength is
    a. zero b. one c. 2π δ(ω)✓ d. 2π

72. Duality property is
    a. $X(t) \leftrightarrow 2\pi\, x(-\omega)$ ✓ b. $x(-t) \leftrightarrow X(-\omega)$
    b. c. both (a) and (b) d. All answers are wrong

73. Fourier transform of $sgn\ (t)$ is
    a. $\frac{2}{j\omega}$✓ b. $-\frac{2}{j\omega}$ c. 1 d. zero

74. Frequency convolution can be stated as
    a. $x_1(t) * x_2(t)$ b. $x_1(\omega) * x_2(\omega)$ ✓
    c. $x_1(\omega)\, x_2(\omega)$ d. $x_1(\omega)/x_2(\omega)$

75. If $x(\omega) = \delta(\omega - \omega_0)$, then $x(t)$ is
    a. $e^{-j\omega_0 t}$ b. $\delta(t)$ c. $\frac{1}{2\pi} e^{j\omega_0 t}$ ✓ d. 1

76. Fourier transform of unit step sequence is ---→ π δ(Ω)+(1/ $j\Omega$)
    a. π δ(Ω) b. $\frac{1}{1-e^{-j\Omega}}$ c. π δ(Ω) + $\frac{1}{1-e^{-j\Omega}}$ d. $1 - e^{-j\Omega}$

77. Tick the correct relationship
    a. $X^*(\Omega) \leftrightarrow x^*[n]$ b. $X^*(\Omega) \leftrightarrow -x^*[n]$

    c. $X^*(-\Omega) \leftrightarrow x^*[n]$ d. $X^*(-\Omega) \leftrightarrow -x^*[n]$✓

78. Discrete Fourier transform and Fourier transform of finite length sequence $x[n]$ is
    a. Same✓ b. different c. All answers are wrong

79. If $x[n]$ is real and odd, then its discrete Fourier series coefficient c_k will be
    a. real b. odd c. imaginary d. both (a) and (c)✓

80. Fourier transform of $x[-n]$ is
    a. $-X(\Omega)$ b. $X(-\Omega)$✓ c. $X(\Omega)$ d. zero

81. Discrete Fourier Series is dual if
    a. $c[n] \overset{DFS}{\longleftrightarrow} \frac{1}{N_0}x[-k]$ ✓ b. $c[n] \overset{DFS}{\longleftrightarrow} x[k]$
    c. $c[n] \overset{DFS}{\longleftrightarrow} x[-k]$ d. $c[n] \overset{DFS}{\longleftrightarrow} N_0 x[k]$

82. ROC is defined as
    a. range of values for which z-transform converges✓
    b. range of values for which z-transform diverges
    c. range of values of n for which the series converges
    d. range of values of n for which the series diverges

83. The system is BIBO stable and causal if the poles of system function H(z) lie
    a. outside the unit circle of the z-plane b. inside the unit circle of the z-plane✓
    c. on the unit circle of the z-plane d. both (a) & (c)

84. The z-transform of the signal nx[n] is
    a. (dX[z]/dz) b. z(dX[z]/dz) c. ($d^2X[z]/dz^2$) d. -z(dX[z]/dz)✓

85. Convolution of two sequences $x_1[n]$ and $x_2[n]$ is
    a. $X_1(z)*X_2(z)$ b. $X_1(z)X_2(z)$✓
    c. $X_1(z)+X_2(z)$ d. All answers are wrong

86. The ROC of the signal $x[n] = (1/3)^n u[n]$ is
    a. $|z| < 1$ b. $|z| > 1$ c. $|z| > \frac{1}{3}$ ✓ d. $|z| < \frac{1}{3}$

87. The z-transform of x[n-k] is
    a. $n^{-1}X(z)$ b. $kX(z^{-1})$ c. $z^{-k}X(z)$✓ d. $X(k^{-1}z)$

88. z-transform helps to convert

a. differential equation into algebraic equation
b. difference equation into algebraic equation ✓
c. both (a) and (b)

89. ROC of the unilateral z-transform is always
a. inside the circle in the z-plane b. outside the circle in the z-plane
c. on the circle d. both (a) & (b)✓

90. System function H(z) for the system described by difference equation y[n]+y[n-1] = x[n] is
a. z/(z+1)✓ b. 1/(z+1) c. z(z+1) d. zero

91. The discrete-time signal x (n) = (-1)n is periodic with fundamental period
6 (B) 4 (C) 2 (D) 0

92. The frequency of a continuous time signal x(t) changes on transformation from x (t) to x (α t), α > 0 by a factor
α (B)1/ α✓ (C) α2 (D) (α) 1/2

93. A useful property of the unit impulse δ(t) is that
(A) δ (at) = a δ (t) (B) δ (at) = δ (t) (C) δ (at) = (1/a) δ(t)✓ (D) δ (at)= [δ (t)]a

94. Two sequences x1 (n) and x2 (n) are related by x2 (n) = x1 (- n). In the z- domain, their ROC's are
(A) the same (B) reciprocal of each other.✓
(C) negative of each other (D) complements of each other.

95. The Fourier transform of the exponential signal ejωot is
(A) a constant.✓ (B) a rectangular gate.
(C) an impulse. (D) a series of impulses.

96. If the Laplace transform of f(t) is ω/(S2+ω2), then the value of Limit t tense to infinity of f(t)
(A) cannot be determined. (B) is zero.✓
(C) is unity. (D) is infinity.

97. The auto-correlation function of a rectangular pulse of duration T is
(A) a rectangular pulse of duration T.
(B) a rectangular pulse of duration 2T.
(C) a triangular pulse of duration T.
(D) a triangular pulse of duration 2T.

98. The Fourier transform (FT) of a function x (t) is X (f). The FT of dx(t)/ dt will be
(A) dX(f)/ df . (B) j2πf X(f). ✓
(C) jf X(f). (D) X(f)/(jf).

99. The FT of a rectangular pulse existing between t = − T / 2 to t = T / 2 is a

(A) sinc squared function. (B) sinc function. ✓
(C) sine squared function. (D) sine function.

100. A given system is characterized by the differential equation: [d2y(t)/dt2]-[dy(t)/dt]-2y(t)= x(t) . The system is:
(A) linear and unstable. (B) linear and stable. ✓
(C) nonlinear and unstable. (D) nonlinear and stable.

101. The system characterized by the equation y(t) = ax(t)+ b is
(A) linear for any value of b. (B) linear if b > 0.
(C) linear if b < 0. ✓ (D) non-linear

102. If R1is the region of convergence of x (n) and R2 is the region of convergence of y(n), then the region of convergence of x (n) convoluted y (n) is
(A) R1+R2. (B) R1−R2.
(C) R1 ∩ R2✓ (D) R1∪ R2 .

103. The continuous time system described by y(t) = x(t2) is
(A) causal, linear and time varying.
(B) causal, non-linear and time varying.
(C) non causal, non-linear and time-invariant.
(D) non causal, linear and time-invariant.✓

104. If G(f) represents the Fourier Transform of a signal g (t) which is real and odd symmetric in time, then G (f) is
(A) complex. (B) imaginary.
(C) real. ✓ (D) real and non-negative.

105. x(n) = a|n|, |a| <1 is
(A) an energy signal.
(B) a power signal.
(C) neither an energy nor a power signal.
(D) an energy as well as a power signal.

106. The signals x1(t) and x2 (t) are both bandlimited to (-ω1, +ω1) and (-ω2, +ω2) respectively. The Nyquist sampling rate for the signal x1(t) x2 (t) will be
(A) 2 ω1 if ω 1> ω2 (B) 2 ω2 if ω 1< ω2.
(C) 2(ω1+ ω2) (D) (ω1+ ω2)/2✓

107.If a periodic function f(t) of period T satisfies f (t) = -f(t+T/2), then in its Fourier series expansion,
(A) the constant term will be zero.
(B) there will be no cosine terms.
(C) there will be no sine terms.
(D) there will be no even harmonics. ✓

108. A band pass signal extends from 1 KHz to 2 KHz. The minimum sampling frequency needed to retain all information in the sampled signal is
(A) 1 KHz. (B) 2 KHz. ✓
(C) 3 KHz. (D) 4 KHz.

109. Given a unit step function u(t), its time-derivative is:
(A) a unit impulse. ✓ (B) another step function.
(C) a unit ramp function. (D) a sine function.

110. The impulse response of a system described by the differential equation [d2y(t)/dt2]+y(t)=x(t) will be
(A) a constant. (B) an impulse function..
(C) a sinusoid. ✓ (D) an exponentially decaying function.

111. The order of a linear constant-coefficient differential equation representing a system refers to the number of
(A) active devices. (B) elements including sources.
(C) passive devices. ✓ (D) All answers are wrong.

112. z-transform converts convolution of time-signals to
(A) addition. (B) subtraction.
(C) multiplication. ✓ (D) division.

113. Region of convergence of a causal LTI system
(A) is the entire s-plane. (B) is the right-half of s-plane. ✓
(C) is the left-half of s-plane. (D) does not exist.

114. The DFT of a signal x(n) of length N is X(k). When X(k) is given and x(n) is computed from it, the length of x(n)
(A) is increased to infinity (B) remains N
(C) becomes 2N – 1 (D) becomes N2

115.Convolution is used to find:
(A) The impulse response of an LTI System✓
(B) Frequency response of a System
(C) The time response of a LTI system
(D) The phase response of a LTI system

116. The Fourier Transform of a rectangular pulse is
(A) Another rectangular pulse (B) Triangular pulse
(C) Sinc function ✓ (D) Impulse.

117. The step response of a LTI system when the impulse response h(n) is unit step u(n) is
(A) n+1 (B) n✓
(C) n-1 (D) n2

118. The function which has its Fourier transform, Laplace transform, and Z transform unity is
(A) Gausian (B) impulse✓
(C) Sinc (D) pulse

119. G(z) = αz-1+ βz-3 is a low pass digital filter with a phase characteristics
same as that of the above question if
(A) α = β (B) α =−β
(C) α = β(1/3) (D) α = β(- 1/3)

120. Direct form-I and Direct form-II exists for
FIR system only (B) IIR system only✓
(C) Both (A) & (B) (D) All answers are wrong

1. Choose the correct statement
   (a) The sum of two periodic signals is always periodic
   (b) A series RLC circuit is a linear system
   (c) A half-wave rectifier circuit is a linear system✓
   (d) $y[n] = 2x[n] + 3$ defines a linear system

2. The signal/function $x[n] = \cos(n)$ is
   (a) periodic with period 2π ✓
   (b) not periodic
   (c) periodic with period π
   (d) periodic with period 4π

3. The period of $x[n] = 5\cos(0.2\pi n)$
   (a) Is not periodic
   (b) Is periodic with period 10
   (c) Is periodic with period 1✓
   (d) Is periodic with period 0.1

4. $\int_{-\infty}^{t} \delta(x)dx$ is equal to:
   (a) 0
   (b) u(t) (step signal)
   (c) 1✓
   (d) $\delta(t)$

5. $x(t) = \cos(wt)\delta(t)$ is equal to
   (a) 0
   (b) u(t) (step signal)
   (c) 1
   (d) $\delta(t)$ ✓

6. $\int_{-\infty}^{\infty} \sin(t)\delta(t-1)dt$ is equal to
   (a) Sin(1)✓
   (b) $\delta(t-1)$
   (c) 0
   (d) Sin(t)

7. The signal $x(t) = t\sin(t)$ is
   (a) An odd signal
   (b) An even signal✓
   (c) Periodic signal
   (d) (a), (b) and (c)

8. The order of precedence for time shifting and scaling the signal x(t) to produce $y(t) = x(2t-1)$
   (a) Is time shifting followed by scaling✓
   (b) Scaling followed by shifting
   (c) Can be done in either order

9. The signal $y(t) = x(t+1)$
   (a) Is x(t) delayed in time by one second (right shift)
   (b) Is x(t) advanced in time by one second (left shift)✓
   (c) Attenuated
   (d) Amplified

10. The z-transform of the signal $x[n] = -\alpha^n u[-n-1]$ is **ANSWER---→(B)**
   (a) $\frac{z}{z-\alpha}$ $|z| > |\alpha|$
   (b) $\frac{z}{z-\alpha}$ $|z| < |\alpha|$
   (c) $\frac{1}{1-\alpha z^{-1}}$ $|z| > |\alpha|$
   (d) Undefined (does not exist)

11. The ROC of the z-transform of the signal $x[n]=\alpha^{|n|} \quad |\alpha|<1$ is: ***ANSWER--→(D)***

(a) $|z|<\frac{1}{|\alpha|}$

(b) $|z|<|\alpha|$

(c) $|\alpha|<|z|<\frac{1}{|\alpha|}$

(d) $\frac{1}{|\alpha|}<|z|<|\alpha|$

12. The z-transform of the signal $x[n]=\begin{cases}1 & n=-1\\ 2 & n=0\\ -1 & n=1\\ 0 & otherwise\end{cases}$ is

(a) $z-2-z^{-1}$

(b) $2z$

(c) $z+2-z^{-1}$

(d) $z-2-z^{-2}$ ✓

13. The z-transform of the signal The z-transform of the signal $x[n]=\left(\frac{1}{2}\right)^{-n}u[-n]$ is

(a) $\frac{1}{1-\frac{1}{2}z^{-1}}, \quad |z|>\frac{1}{2}$

(b) $\frac{1}{1-\frac{1}{2}z}, \quad |z|>2$

(c) $\frac{1}{1-\frac{1}{2}z}, \quad |z|<\frac{1}{2}$

(d) $\frac{1}{1-\frac{1}{2}z}, \quad |z|<2$

✓

14.) The z-transform of the signal The z-transform of the signal $x[n] = n\left(\frac{-1}{2}\right)^n u[n]$ is

(a) $\frac{\frac{-1}{2}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)^2}, \quad |z| > \frac{1}{2}$

(b) $\frac{\frac{-1}{2}z^{-1}}{\left(1-\frac{1}{2}z^{-1}\right)^2}, \quad |z| > \frac{1}{2}$

(c) $\frac{\frac{-1}{2}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)^2}, \quad |z| < \frac{1}{2}$

(d) $\frac{\frac{-1}{2}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)^2}, \quad |z| < 2$

15. Consider the sequence x[n] whose z-transform is given by $X(z) = -2 - 8z - 16z^2$. x[2] equals:

a. -16
b. 16
c. 0
d. -2

16. The bilateral z-transform of the signal x[n-1] is:

a. $z^{-1}X(z)$
b. $z\ X(z)$
c. $z^{-1}X(z) + x[-1]$
d. $z^{-1}X(z) - x[-1]$

17. Consider the system defined by $y[n] = x^2[n]$. The system is:

    a. Not Memoryless
    b. Linear
    c. BIBO stable
    d. Time Variant

18. Express the discrete time delta function in terms of the discrete time unit step function:

    a. $\delta[n] = u[n+1] - u[n-1]$
    b. $\delta[n] = u[n] - u[n-1]$
    c. $\delta[n] = u[n+1] - u[n]$
    d. $\delta[n] = \sum_{-\infty}^{n} u[k]$

19. Consider the signal $x[n] = \begin{cases} 2 & for \quad n = -1 \\ 1 & for \quad n = 0 \\ -1 & for \quad n = 1 \\ 0 & otherwise \end{cases}$ Express x[n] in terms of the unit impulse function.

    a. $x[n] = \delta[n] + \delta[n-1]$
    b. $x[n] = 2\delta[n+1] + \delta[n] - \delta[n-1]$
    c. $x[n] = 2\delta[n-1] + \delta[n] - \delta[n+1]$
    d. $x[n] = 2\delta[n+1] - \delta[-n]$

20. $\int_{-\infty}^{\infty} e^t \delta(t-1)dt$ is equal to

    a. e
    b. $\delta(t-1)$
    c. 0
    d. e^t

21. The signal $x(t) = t\cos(t)$ is

    a. An odd signal
    b. An even signal
    c. Periodic signal
    d. None of the above

22. The z-Transform of $\delta[n]$ is

a. $\delta[z]$
b. 0
c. 1
d. z

23. The signal $x(t) = e^{j\omega_0 t}$ is
    a. a power signal
    b. an energy signal
    c. both power and energy signal
    d. neither a power or energy signal

24. Consider a signal x[n] with Z-transform $X(z) = e^{z}$. x[1] equals
    a. 1
    b. -1
    c. 0
    d. 0.5

25. Fourier Transform (FT) of $x(t) = te^{-2t}u(t)$
    a. 1
    b. -1
    c. 0
    d. 0.5

26. The FT of $\delta(t-10)$ is:
    a. $e^{-j\,10\,\omega}$
    b. $e^{j\,10\,\omega}$
    c. 1
    d. $e^{-j\omega}$

27. If the FT of x(t) is X(ω), the FT of X(t) is
    a. $x(\omega)$
    b. $2\pi\, x(\omega)$
    c. $2\pi\, x(-\omega)$
    d. $x(-\omega)$

28. If the FT of $x(t)$ is $X(\omega)$, what is the inverse FT of $X(\omega-\omega_c)$?

a. $e^{-j\omega_c t}x(t)$

b. $\cos(\omega_c t)x(t)$

c. $x(-t)$

d. $e^{j\omega_c t}x(t)$

29. The Fourier Transform of the signal $x(t)=e^{j\omega_0 t}$ is

a. $\delta(\omega+\omega_0)$

b. $2\delta(\omega-\omega_0)$

c. $2\pi\,\delta(\omega-\omega_0)$

d. 1

30.) The convolution $u(t)*u(t)$, where u(t) is the unit step signal yields:

(a) $t^2u(t)$

(b) $u(t)$

(c) $t^3u(t)$

(d) $tu(t)$

31.) The relationship between the delta function $\delta(t)$ and the signum function $\operatorname{sgn}(t)=\begin{cases}1, & t>0\\ -1, & t<0\end{cases}$ is:

(a) $\text{sgn}(t) = 2\delta(t)$

(b) $\frac{d}{dt}\text{sgn}(t) = 2\delta(t)$

(c) $-2\delta(t)$

(d) $t\delta(t)$

ELECTRICAL CIRCUITS

1. Reciprocal of resistance is called
a. Resistivity ✓b. Conductance
c. Impedance d. admittance

2. When the resistances are connected in parallel circuit then
✓a. Branch currents are additive b. Resistance's are additive
c. Branch voltages are additive d. frequencies are additive

3. The reactance offered by the capacitor to alternating current of frequency 50 Hz is 20 ohms. If frequency is increased to 100 Hz, reactance becomes _____ ohms.
a. 2.5 b. 5
c. 15 ✓d. 10

4. If a motor is rated for 3 phase 415 V 50 Hz, then the voltage said to be
✓a. Line Voltage b. Phase Voltage
c. Average Voltage d. Peak Voltage

5. A resistor consumes 5 watts, and its current is 10 amps. What is its voltage?
a. 10 V ✓b. 0.5 V
c. 2 V d. 15 V

6. If you plot voltage vs. current in a circuit, and you get a linear line, what is the significance of the slope?
a. Power b. Power factor
✓c. Resistance d. Impedance

7. If you put an infinite number of resistors in parallel, what would the total resistance be?
✓a. R_{Total} would approach zero as the no. of resistors in parallel approaches infinity
b. R_{Total} would approach 1 as the no. of resistors in parallel approaches infinity
c. R_{Total} would approach infinity as the no. of resistors in parallel approaches infinity
d. It is not possible to connect that number of resistors in parallel

8. Two resistors of 4 Ω and 6 Ω are connected series to a supply of 20 V. The load is in parallel with 6 Ω .Then the Thevenin's resistance is
a. 10 Ω ✓b. 2.4 Ω c. 4.2 Ω d. 4Ω

9. To find Thevenin's resistance, the current source in the given circuit should be
✓a. open circuited b. short circuited
c. transformed to voltage source d. included

10. Two resistors connected in series have an equivalent resistance of 18 ohms and when connected in parallel have an equivalent resistance of 4 ohms. Find the value of both the resistances.
a.9Ω ,9Ω b.2Ω ,2Ω ✓c.12Ω ,6Ω d.14Ω ,4Ω

11. A star connected system has three resistance of value R Ω .The resistance in one of the three arms of the equivalent delta system is

a. R/3 ✓b. 3R c. R/2 d. 2R

12. At half power frequencies, the series RLC circuit current is

a. Same as the resonant current b. $\frac{1}{2}$ of the resonant current

✓c. $\frac{1}{\sqrt{2}}$ of the resonant current d. twice of the resonant current

13. Among these which one is not related to Q factor for series RLC circuit

a) $\frac{\omega oL}{R}$ b) $\frac{1}{\omega oCR}$ c) $\frac{1}{R}\sqrt{\frac{L}{C}}$ ✓d) $\frac{1}{R}\sqrt{\frac{C}{L}}$

14. If the frequency of single phase supply is 50 Hz, then 3 phase supply frequency is

a) $\frac{1}{\sqrt{3}}$ 50 Hz ✓b) 50 Hz c) 3*50 Hz d) $\sqrt{3}$ *50 Hz

15. In any RLC series circuit, the f > f0 then the circuit behaves as_____ nature

a) capacitive b) resistive ✓c) inductive d) susceptive

16. At unbalanced condition, angle between each phases of 3 phase supply are

✓a) 120^o b) 180^o c) 240^o d) 0^o

17. In 3 phase balanced delta connected load, line current is ____ times of phase current

✓a) $\sqrt{3}$ b) 3 c) $\frac{1}{\sqrt{3}}$ d) $\frac{1}{3}$

18. Total inductance of two series coils L1 and L2 which are connected in such a way to cancel out the portion of magnetic flux is

a. L1+L2+2M b. L1-L2-2M

✓c. L1+L2-2M d. L1-L2+2M

19. The effect of an air gap in a magnetic circuit is to:

a. increases the reluctance b. reduces the flux density

c. reduces the flux ✓d. reduces the magneto motive force

20. In a pure Inductive circuit,

✓a. Current lags behind the voltage by 90

b. Current leads behind the voltage by 90

c. Current and voltage are in-phase

d. Current is zero.

21. In series resonant circuit, increasing inductance to its twice value and reducing capacitance to its half value

a. will change the maximum value of current at resonance

b. will change the impedance at resonance frequency

c. will change the resonance frequency

✓d. will increase the selectivity of the circuit

22. The square waveform of current has following relation between R.M.S. value and average value

✓a. R.M.S. value is equal to average value

b. R.M.S. value of current is greater than average value

c. R.M.S. value of current is less than average value

d. Only average value

23. In a highly capacitive circuit the

a. apparent power is equal to the actual power

b. reactive power is more than the apparent power

✓c. reactive power is more than the actual power

d. actual power is more than its reactive power

24. In a circuit containing R, L and C, power loss can take place in

a. C only

b. L only

✓c. R only

d. RLC evenly

25. Form factor for a sine wave is (the correct answer is, 1.11)

a. 1.414

b. 1.372

c. 1

d. 0.707

26. In a series resonant circuit, impedance in the circuit is

a. Maximum

✓b. Minimum

c. Unity

d. zero

27. Super position theorem is not applicable for

a. Current Calculation

b. Voltage Calculation

c. Current flow direction

✓d. Power calculation

28. Core loss is also called as ----------?

a. Eddy current loss

b. Hysteresis loss

✓c. Magnetic loss

d. Copper loss

29. Maximum efficiency will occur, when copper loss is_____to iron loss

a. greater than

b. less than

✓c. equal

d. Not applicable

30. The direction of rotation of conductors of a DC motor can be determined by

a. Ampere law

✓b. Fleming's left hand rule

c. Fleming's right hand rule

d. Lenz's law

31. Resistivity of a wire depends on

a. Length

b. Material✓

c. cross section area

d. none of the above.

32. Two bulbs marked 200 watt-250 volts and 100 watt-250 volts are joined in series to 250 volts supply. Power consumed in circuit is

a. 33 watt

b. 67 watt✓

c. 100 watt

d. 300 watt

33. Ampere second could be the unit of

a. power

b. conductance

c. energy

d. charge✓

34. Which of the following is not the same as watt?

a. joule/sec

b. amperes/volt✓

c. amperes x volts

d. (amperes)2 x ohm

35. An electric current of 5 A is same as

a. 5 J / C

b. 5 V / C

c. 5 C / sec✓
d. 5 w / sec

36. The value of the following is given by 100 (kilo ampere) x (micro ampere) 100 milli ampere * 10 ampere
a. 0.001 A✓
b. 0.1 A
c. 1 A
d. 10A

37. Two resistances R_1 and R_2 give combined resistance of 4.5 ohms when in series and 1 ohm when in parallel. The resistances are
a. 3 ohms and 6 ohms
b. 3 ohms and 9 ohms
c. 1.5 ohms and 3 ohms✓
d. 1.5 ohms and 0.5 ohms

38. We have three resistances of values 2 Ω, 3 Ω and 6 Ω. Which of the following combination will give an effective resistance of 4 Ω?
a. All the three resistances in parallel
b. 2 Ω resistance in series with parallel combination of 3 Ω and 6 Ω resistance✓
c. 3 Ω resistance in series with parallel combination of 2 Ω and 6 Ω resistance
d. 6 Ω resistance in series with parallel combination of 2 Ω and 3 Ω resistance

39. When P = Power, V = Voltage, I = Current, R = Resistance and G = Conductance, which of the following relation is incorrect?
a. V = √ (PR)
b. P= V2G
c. G= P / I2✓
d. I =√ (P / R)

40. Which of the following bulbs will have the least resistance?
a. 220 V, 60 W
b. 220 V, 100 W
c. 115 V, 60 W
d. 115 V, 100 W✓

41. Ohm's law is not applicable to
a. DC circuits
b. high currents
c. small resistors
d. semi-conductors✓

42. The period of a sine wave is 20 mili seconds. Its frequency is
   a. 20 Hz
   b. 30 Hz
   c. 40 Hz
   d. 50 Hz✓

43. Capacitive reactance is more when
   a. capacitance is less and frequency of supply is less✓
   b. capacitance is less and frequency of supply is more
   c. capacitance is more and frequency of supply is less
   d. capacitance is more and frequency of supply is more

44. Form factor for a sine wave is
   a. 1.414
   b. 0.707
   c. 1.11✓
   d. 0.637

45. The voltage of domestic supply is 220V. This figure represents
   a. mean value✓
   b. r.m.s. value
   c. peak value
   d. average value
   e.

46. Form Factor is the ratio of
   a. average value/r.m.s. value
   b. average value/peak value
   c. r.m.s. value/average value✓
   d. r.m.s. value/peak value

47. The phase difference between voltage and current wave through a circuit element is given as 30^0. The essential condition is that
   a. both waves must have same frequency
   b. both waves must have identical peak values
   c. both waves must have zero value at the same time
   d. none of the above

48. The internal resistance of a 20,000 ohm/volt voltmeter set on its 5 V range is
   a. 20,000
   b. 100,000

c. 200,000
d. 1,000,000

49. Two 1.2 kΩ resistors are in series and this series combination is in parallel with a 3.3 kΩ resistor. The total resistance is
a. 138
b. 1,389
c. 5,700
d. 880

50. A voltage divider consists of two 68 k resistors and a 24 V source. The unknown output voltage is
a. 12 V
b. 24 V
c. 0 V
d. 6 V

51. The parallel combination of a 6.8 k resistor and a 10 k resistor is in series with the parallel combination of a 2.2 k resistor and a 1 k resistor. A 100 V source is connected across the circuit. The resistor(s) with the greatest voltage drop is (are)
a. 6.8 k
b. 2.2 k
c. 6.8 k and 10 k
d. 2.2 k and 1 k

52. When a load resistance is removed from the output of a voltage divider circuit, the current drawn from the source
a. decreases
b. Increases
c. remains the same
d. is cut off

53. A certain circuit is composed of two parallel resistors. The total resistance is 1,403 Ω. One of the resistors is 2 k . The other resistor value is
a. 1,403 Ω
b. 4.7 k
c. 2 k
d. 3,403 Ω

54. The parallel combination of a 470 Ω resistor and a 1.2 kΩ resistor is in series with the

parallel combination of three 3 kΩ resistors. A 200 V source is connected across the circuit. The resistor with the most current has a value of

a. 470 Ω or 1.2 kΩ

b. 3 kΩ

c. 470 Ω

d. 1.2 kΩ

55. A 680 Ω load resistor, RL, is connected across a constant current source of 1.2 A. The internal source resistance, RS, is 12 k Ω. The load current, RL, is
a. 0 A
b. 1.2 A
c. 114 mA
d. 1.14 A

56. A 12 mA current source has an internal resistance, RS, of 1.2 k Ω. The equivalent voltage source is
a. 144 V
b. 14.4 V
c. 7.2 V
d. 72 mV

57. When the speed at which a conductor is moved through a magnetic field is increased, the induced voltage
a. increases
b. decreases
c. remains constant
d. reaches zero

58. If the cross-sectional area of a magnetic field increases, but the flux remains the same, the flux density
a. increases
b. decreases
c. remains the same
d. doubles

59. When the current through the coil of an electromagnet reverses, the

a. direction of the magnetic field reverses
b. direction of the magnetic field remains unchanged
c. magnetic field expands
d. magnetic field collapses

60. When a solenoid is activated, the force that moves the plunger is
a. an electromagnetic field
b. a permanent magnetic field
c. varying voltage
d. a steady current

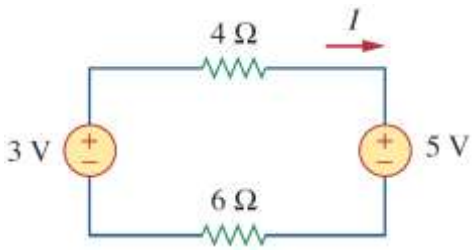
61. An electric heater draws 10 A from a 120-V line. The resistance of the heater is:
a. 1200 Ω
b. 120 Ω
c. 12 Ω
d. 1.2 Ω

62. The voltage drop across a 1.5-kW toaster that draws 12 A of current is:
a. 18 kV
b. 125 V
c. 120 V
d. 10.42 V

63. The maximum current that a 2W, 80 k resistor can safely conduct is:
a. 160 kA
b. 40 kA
c. 5 mA
d. 25μA

64. A network has 12 branches and 8 independent loops. How many nodes are there in the network?
a. 19
b. 17
c. 5
d. 4

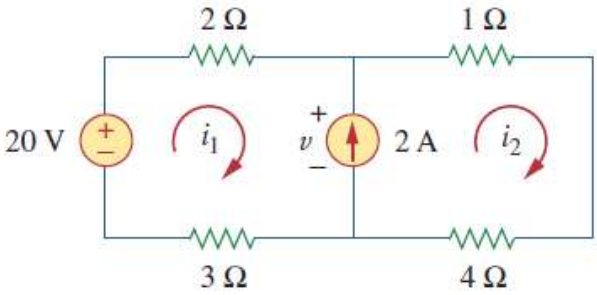
65. The current I in the circuit of Fig. is:



a. – 0.8 A

b. – 0.2 A
c. 0.2 A
d. 0.8 A

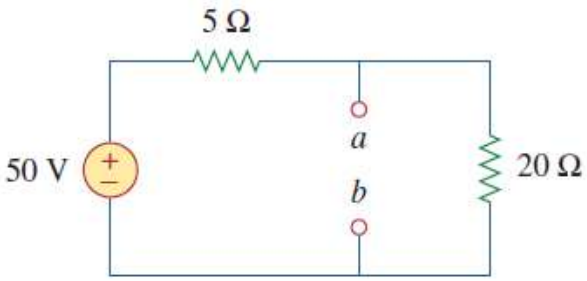
66. In the circuit of Fig., current is:



a. 4 A
b. 3 A
c. 2 A
d. 1 A

67. The current through a branch in a linear network is 2 A when the input source voltage is 10V. If the voltage is reduced to 1 V and the polarity is reversed, the current through the branch is:
a. – 2 A
b. – 0.2 A
c. 0.2 A
d. 2 A

68. The Norton current at terminals a and b of the circuit in Fig. is:



a. 10 A
b. 2.5 A
c. 2 A
d. 0 A

69. A load is connected to a network. At the terminals to which the load is connected, RTh = 10Ω and VTh = 40V. The maximum possible power supplied to the load is:
a. 160 W
b. 80 W
c. 40 W
d. 1 W

70. What charge is on a 5-F capacitor when it is connected across a 120-V source?
   a. 600 C
   b. 300 C
   c. 24 C
   d. 12 C

71. When the total charge in a capacitor is doubled, the energy stored:
   a. remains the same
   b. is halved
   c. is doubled
   d. is quadrupled

72. A 5-H inductor changes its current by 3 A in 0.2 s. The voltage produced at the terminals of the inductor is:
   a. 75 V
   b. 8.888 V
   c. 3 V
   d. 1.2 V

73. A capacitor in an RC circuit with R = 2 Ω and C = 4 F is being charged. The time required for the capacitor voltage to reach 63.2 percent of its steady-state value is:
   a. 2 s
   b. 4 s
   c. 8 s
   d. 16 s

74. In a series RLC circuit, setting R = 0 will produce:
   a. an overdamped response
   b. a critically damped response
   c. an underdamped response
   d. an undamped response
   e. none of the above

75. A parallel RLC circuit has L = 2 H and C = 0.25 F. The value of R that will produce unity damping factor is:
   a. 0.5 Ω
   b. 1 Ω
   c. 2 Ω
   d. 4 Ω

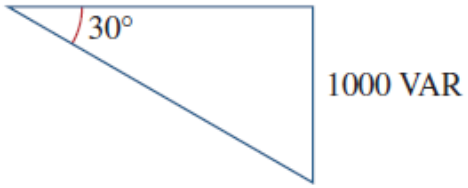
76. A series RC circuit has |VR| = 12 V and |VC| = 5 V. The magnitude of the supply voltage is:
   a. – 7 V
   b. 7 V
   c. 13 V

d. 17 V

77. A function that repeats itself after fixed intervals is said to be:
a. a phasor
b. harmonic
c. periodic
d. reactive

78. If the load impedance is 20 - j20, the power factor is
a. 0.7071 (lagging)
b. 0
c. 1
d. 0.7071 (leading)

79. For the power triangle in Fig., the apparent power is:



a. 2000 VA
b. 1000 VAR
c. 866 VAR
d. 500 VAR

80. How much inductance is needed to resonate at 5 kHz with a capacitance of 12 nF?
a. 2,652 H
b. 11.844 H
c. 3.333 H
d. 84.43 mH

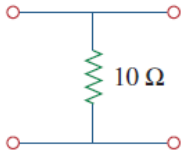
81. The difference between the half-power frequencies is called the:
a. quality factor
b. resonant frequency
c. bandwidth
d. cutoff frequency

82. In a series RLC circuit, which of these quality factors has the steepest magnitude response curve near resonance?
a. Q = 20
b. Q = 12
c. Q = 8
d. Q = 4

83. What kind of filter can be used to select a signal of one particular radio station?

a. lowpass
b. highpass
c. bandpass
d. bandstop

84. For the single-element two-port network in Fig., Z11 is:



a. 0
b. 5
c. 10
d. 20

85. A two-port is described by the following equations:

$$\mathbf{V}_1 = 50\mathbf{I}_1 + 10\mathbf{I}_2$$
$$\mathbf{V}_2 = 30\mathbf{I}_1 + 20\mathbf{I}_2$$

Which of the following is *not* true?

a. Z12 = 10
b. y12 = – 0.0143
c. h12 = 0.5
d. A = 50

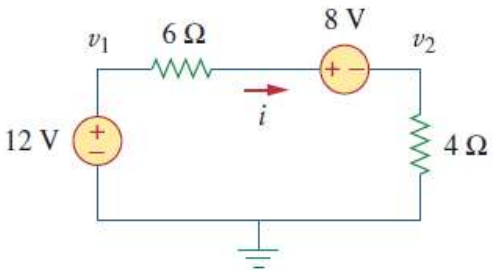
86. If a two-port is reciprocal, which of the following is not true?

a. Z21 = Z12
b. y21 = y12
c. h21 = h12
d. AD = BC + 1

87. When port 1 of a two-port circuit is short-circuited, I1 = 4 I2 and V2 = 0.25 I2. Which of the following is true?

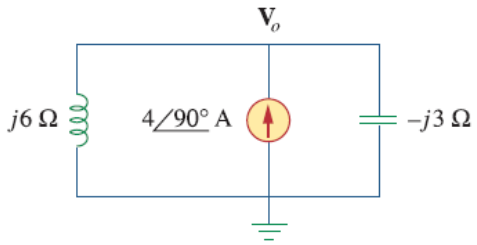
a. y11 = 4
b. y12 = 16
c. y21 = 16
d. y22 = 0.25

88. In the circuit of Fig., the voltage V2 is:



a. – 8 V
b. – 1.6 V
c. 1.6 V
d. 8 V

89. Using Nodal analysis, the value of Vo in the circuit of Fig. is



a. – 24 V
b. – 8 V
c. 8 V
d. 24 V

90. The coefficient of coupling for two coils having L1 = 2 H, L2 = 8 H, M =3 H is
a. 0.1875
b. 0.75
c. 1.333
d. 5.333

91. Resistivity of a wire depends on
a. length
b. material
c. cross section area
d. All answers are wrong

92. When n resistances each of value r are connected in parallel, then resultant resistance is x. When these n resistances are connected in series, total resistance is

a. nx
b. rnx
c. x/n
d. n^2 x

93. Resistance of a wire is r ohms. The wire is stretched to double its length, then its resistance in ohms is

a. r/2
b. 4r
c. 2r
d. r/4

94. Kirchhoff's second law is based on law of conservation of

a. Charge
b. Energy
c. Momentum
d. Mass

95. Two bulbs marked 200 watt-250 volts and 100 watt-250 volts are joined in series to 250 volts supply. Power consumed in circuit is

a. 33 watt
b. 67 watt
c. 100 watt
d. 300 watt

96. Which of the following is not the same as watt?

a. joule/sec
b. amperes/volt
c. amperes x volts
d. $(\text{Amperes})^2$ x ohm.

97. One kilowatt hour of electrical energy is the same as

a. 36×10^5 watts
b. 36×10^5 ergs
c. 36×10^5 joules
d. 36×10^5 B.T.U.

98. A circuit contains two un-equal resistances in parallel

a. current is same in both
b. large current flows in larger resistor
c. potential difference across each is same
d. smaller resistance has smaller conductance

99. Three 3 ohm resistors are connected to form a triangle. What is the resistance between any two of the corners?
a. 3 / 4 ohms
b. 3 ohms
c. 2 ohms
d. 4/3 ohm.

100. How many different combinations may be obtained with three resistors, each having the resistance R?
a. 3
b. 4
c. 5
d. 6

101. Ohm's law is not applicable to
a. DC circuits
b. high currents
c. small resistors
d. semi-conductors

102. A wire of resistance R has it length and cross-section both doubled. Its resistance will become
a. 4R
b. 2R
c. R
d. R/4

103. Three elements having conductance G1, G2 and G3 are connected in parallel. Their combined conductance will be
a. 1/(1/G1 + 1/G2 + 1/G3)
b. (G1G2 + G2G3 + G3G1)/(G1 + G2 + G3)
c. 1/(G1 + G2+ G3)
d. G1 + G2 +G3

104. Which of the following has negative temperature coefficient?

a. Brass
b. Mercury
c. Electrolytes
d. Silver

105. Conductance is expressed in terms of
a. ohm/m
b. m/ohm
c. mho/m
d. mho

106. Two resistances R1 and R2 give combined resistance of 4.5 ohms when in series and 1 ohm when in parallel. The resistances are
a. 3 ohms and 6 ohms
b. 3 ohms and 9 ohms
c. 1.5 ohms and 3 ohms
d. 1.5 ohms and 0.5 ohms

107. When P = Power, V = Voltage, I = Current, R = Resistance and G = Conductance, which of the following relation is incorrect?
a. V = √ (PR)
b. P= V2G
c. G= P / I2
d. I =√ (P / R)

108. Kirchhoff's Current law is applicable only
a. Junction in a network
b. Closed loop in a network
c. Electric Circuits
d. Electronics Circuits

109. Superposition theorem can be applied only to circuits having
a. Resistive elements
b. Passive elements
c. Non-linear elements
d. Linear bilateral elements

110. The concept of superposition theorem is based on
a. Reciprocity
b. Duality

c. Non-linearity
d. Linearity

111. Which of the following is non-linear circuit parameter?

a. Inductance
b. Condenser
c. Wire wound resistor
d. Transistor

112. If there are 'b' branches and 'n' nodes the number of equations will be

a. n-1
b. b
c. b-n-1
d. b-n+1

113. For maximum transfer of power, internal resistance of the source should be

a. Equal to load resistance
b. Less than that of the load
c. More than that of the load
d. Zero

114. Which of the following is correct

a. Norton's equivalent resistance is the same as Thevenin's equivalent resistance
b. Norton's equivalent is the current equivalent of the network
c. The load is connected in parallel to the Norton's equivalent resistance and Norton's equivalent current source
d. All the above

115. A nonlinear network does not satisfy

a. Superposition condition
b. Homogeneity condition
c. Both Homogeneity as well as Superposition condition
d. Homogeneity, Superposition and Associativity

116. Application of Norton's Theorem to a circuit yields

a. Equivalent current source and impedance in series
b. Equivalent current source and impedance in parallel
c. Equivalent impedance
d. Equivalent current source

117. A Circuit of zero lagging power factor behaves as

a. An inductive circuit
b. A capacitive circuit
c. R-L circuit
d. R-C circuit

118. The power factor of an ac circuit is equal to

a. Cosine of the phase angle
b. Sine of the phase angle
c. Tangent of the phase angle
d. Cotangent of the phase angle

119. In order to improve the power factor which device should be connected to the power system

a. Series capacitor

b. Shunt capacitor
c. Series inductor
d. Shunt inductor

120. The power factor of ac circuit lies between
a. 0 and 1
b. -1 and 1
c. 0 and -1
d. All answers are wrong

121. A unit step current is applied to a network consisting of only passive elements. The voltage across the current source observed is $v(t)= (1+e^{-i\delta t})$. The simplest possible network will consist of the elements
a. 1 resistor and 2 capacitor
b. 1 resistor and 2 inductor
c. 2 resistor and 1 capacitor
d. 2 resistor and 1 inductor

122. A series RLC circuit consisting of R= 10 ohms, XL = 20 ohms, and Xc = 20 ohms is connected across an ac supply of 100V (rms). The magnitude and phase angle (with reference to supply voltage) of the voltage across the inductive coil are respectively
a. 100 V, 90°
b. 100 V, -90 °
c. 200 V, -90 °
d. 200 V, 90 °

123. Two coils in differential connection have self-inductance of 2 mH and 4 mH and mutual inductance of 0.15 mH. The equivalent inductance of the combination is
a. 5.7 mH
b. 5.85 mH
c. 6 mH
d. 6.15 mH

124. A choke coil having resistance R ohms and of L henry is shunted by a capacitor of C farads. The dynamic impedance of the resonant circuit would be
a. R/LC
b. C/ RL
c. L/ RC
d. 1 / RLC

125. A two terminal black box contains one of the RLC elements. The black box is connected to a 200 V A.C supply. The current through the source is I. When a capacitance of 0.1 F is inserted in series between the source and the box, the current through the source is 2I. The element is

a. Resistance
b. inductance
c. capacitor of 0.5 F
d. it is not possible to determine the element

126. A series RLC circuit has R = 50 Ω, L = 100 mH and C = 1□F. The lower half power frequency of the circuit is

a. 30.55 kHz
b. 51.92 kHz
c. 3.055 kHz
d. 1.92 kHz

127. Two 2H inductance coils are connected in series and are also magnetically coupled to each other. The coefficient of coupling being 0.1. The total inductance of the combination can be

a. 0.4 H
b. 3.2 H
c. 4.0 H
d. 3.6 H

128. A network contains linear resistors and ideal voltage sources. If values of all the resistors are doubled, then the voltage across each resistor is

a. Halved
b. Doubled
c. Increased by four times
d. Not changed

129. A source of angular frequency 1 rad/sec has a source impedance consisting of 1Ω resistance in series with 1 H inductance. The load that will obtain the maximum power transfer is

a. 1 Ω resistance
b. 1 Ω resistance in parallel with 1H inductance
c. 1 Ω resistance in series with 1 F capacitor
d. 1 Ω resistance in parallel with 1 F capacitor

130. To a highly inductive circuit a small capacitance is added in series. The angle between voltage and current will

a. Increase

b. Decrease
c. Remain nearly the same
d. become indeterminant

131. The value of current at resonance in a series RLC circuit is affected by the value of
a. R
b. C
c. L
d. All the answers are correct

132. A load that has a resistance of 10Ω is to be connected to a supply that has a constant voltage of 120 volts. If it is desired that the current to the load be varied from 3 to 5 Amperes, what are the resistance and the current rating of the series rheostat that permit this variation?
a. 30 Ω, 5A
b. 10 Ω, 10 A
c. 20 Ω, 10 A
d. 20 Ω, 10 A

133. A balanced star connected load with impedance of 20□-30□ Ω is supplied from a 3 phase 4 wire 173 volt system, the voltages to neutral being 100□-90□, 100□-30□, 100□-150□. The current in the neutral wire is
a. 5 A
b. 8.85 A
c. Zero
d. 50 A

134. An RLC resonant circuit has a resonance frequency of 1.5 MHz and a bandwidth of 10 kHz. If C = 150 pF, then the effective resistance of the circuit will be
a. 29.5 Ω
b. 14.75 Ω
c. 9.5 Ω
d. 4.7 Ω

135. In series resonance having values of R, L and C are 25 Ω, 0.04 H and 0.01 □F. The frequency at which voltage across L will be maximum at
a. 7.96 kHz
b. 8 kHz
c. 7.9 kHz
d. 8.3 kHz

136. Superposition theorem is NOT applicable to networks containing

a. Nonlinear elements
b. Dependent voltage sources
c. Dependent current sources
d. Transformers

137. The current i(t) through a 10 Ω resistor in series with an inductance is given by i(t) = 3 + 4 sin (100t + 45°) + 4 sin (300t + 60°) Amperes. The RMS value of the current and the power dissipated in the circuit are

a. √41 A,410 W
b. √(35) A,350 W
c. 5A, 250 W
d. 11 A, 1210 W

138. If each branch of a Delta circuit has impedance √(3) Z, then each branch of the equivalent Wye circuit has impedance

a. Z / √3
b. 3 Z
c. 3 √3 Z
d. Z/ 3

139. A network contains only independent current sources and resistors. If the values of all resistors are doubled, the values of the node voltages

a. Will become half
b. Will remain unchanged
c. Will become double
d. Cannot be determined until the circuit configuration and the values of the resistors are known.

140. Two incandescent light bulbs of 40 W and 60 W rating are connected in series across the mains. Then

a. Bulbs together consume 100W
b. Bulbs together consume 50 W
c. 60W bulb glows brighter
d. 40 W bulb glows brighter

141. The combined resistance of two equal resistors connected in parallel is equal to

a. One half the resistance of one resistor
b. Twice the resistance of one resistor
c. Four times the resistance of one resistor
d. One fourth the resistance of one resistor

142. The average power delivered to an impedance (4 − j3)Ω by a current 5 cos (100πt + 100)A is

a. 44.2 W
b. 50 W
c. 62.5 W
d. 125 W

143. A lossy capacitor Cx , rated for operation at 5 kV, 50 Hz is represented by an equivalent circuit with an ideal capacitor Cp in parallel with a resistor Rp . The value Cp is found to be 0.102 µF and value of Rp = 1.25MΩ. Then the power loss and tan δ of the lossy capacitor operating at the rated voltage, respectively, are

a. 10 W and 0.0002
b. 10 W and 0.0025
c. 20 W and 0.025
d. 20 W and 0.04

144. The Thevenin's equivalent of a circuit operation at ω = 5 rads/s, has V_{oc} = 3.71 $\angle 15.9^{\circ}$ V and Z_0 = 2.38 − j0.667 Ω. At this frequency, the minimal realization of the Thevenin's impedance will have a

a. resistor and a capacitor and an inductor
b. resistor and a capacitor
c. resistor and an inductor
d. capacitor and an inductor

145. A 3 V DC supply with an internal resistance of 2 Ω supplies a passive non-linear resistance characterized by the relation VNL = I2NL. The power dissipated in the non linear resistance is

a. 1.0 W
b. 1.5 W
c. 2.5 W
d. 3.0 W

146. An ideal capacitor is charged to a voltage V0 and connected at t = 0 across an ideal inductor L. (The circuit now consists of a capacitor and inductor alone). If we let ω0 = 1/√LC , the voltage across the capacitor at time t > 0 is given by

a. V_0
b. $V_0 \text{ Cos } (\omega_0 t)$
c. $V_0 \text{ Sin } (\omega_0 t)$
d. $V_0 e^{-\omega 0 t} \text{Cos } (\omega_0 t)$

147. The RMS value of the voltage u(t)= 3 + 4 cos (3t) is

a. √17 V
b. 5 V
c. 7 V
d. 3 + 2 √2 V

148. The rms value of the current in a wire which carries a d.c. current of 10 A and a sinusoidal alternating current of peak value 20 A is

a. 10 A
b. 14.14 A
c. 15 A
d. 17.32 A

149. A passive 2-port network is in a steady-state. Compared to its input, the steady state output can never offer

a. higher voltage
b. lower impedance
c. greater power
d. better regulation

150. A 240 V single-phase ac source is connected to a load with an impedance of $10\angle 60^{\circ}\Omega$. A capacitor is connected in parallel with the load. If the capacitor supplies 1250 VAR, the real power supplied by the source is

a. 3600 W
b. 2880 W
c. 240 W
d. 1200 W

151. In a carbon resistor in case fourth stripe is not present, it can be concluded that

a. The resistor is highly accurate
b. The resistor is defective
c. The resistor does not contain carbon
d. The tolerance limit is ± 20 %

152. In series as well as parallel circuits the equivalent (total) value of certain parameter is given by X = X1 + X2 + X3 + X4 + ... The parameter X could be

a. resistance
b. current
c. voltage
d. power

153. Voltage dependent resistors are used

a. as current stabilizers
b. as heating elements
c. for inductive circuits
d. to suppress surges

154. We have three resistances of values 2 Ω, 3 Ω and 6 Ω. Which of the following combination will give an effective resistance of 4 Ω?

a. All the three resistances in parallel
b. 2 Ω resistance in series with parallel combination of 3 Ω and 6 Ω resistance
c. 3 Ω resistance in series with parallel combination of 2 Ω and 6 Ω resistance
d. 6 Ω resistance in series with parallel combination of 2 Ω and 3 Ω resistance

155. Two batteries have an open-circuit voltage of 12.8 volts each and an internal resistance of 0.08 ohms. The short circuit current of two batteries connected in parallel will be

a. 80 A
b. 120 A
c. 160 A
d. 320 A

156. Materials having electrical conductivity much less than most of the metals but much greater than that of typical insulators, are known as

a. thermistors
b. varistors
c. semi-conductors
d. variable resistors.

157. What is the range between f1 and f2 of an RLC circuit that resonates at 150 kHz and has a Q of 30?

a. 100.0 kHz to 155.0 kHz
b. 147.5 kHz to 152.5 kHz
c. 4500 kHz to 295.5 kHz
d. 149,970 Hz to 150,030 Hz

158. In a nickel-cadmium-alkali cell the electrolyte is

a. Sulphuric acid
b. Potassium hydroxide
c. Zinc chloride
d. Ammonium chloride.

159. When checked with an ohm meter an open resistor reads

a. Zero
b. High but within tolerance
c. Low but not zero
d. Infinite

160. Which among the following is also regarded as 'Dual of Thevenin's Theorem'?

a. Norton's Theorem
b. Superposition Theorem
c. Millman's Theorem
d. Maximum Power Transfer Theorem

161. How much current will flow in a 100 Hz series RLC circuit if VS = 20 V, RT = 66 ohms, and XT = 47 ohms?

a. 1.05 A
b. 303 mA
c. 247 mA
d. 107 mA

162. What is the true power consumed in a 30 V series RLC circuit if Z = 20 ohms and R = 10 ohms?

a. 15.0 watts
b. 22.5 watts
c. 30.0 watts
d. 45.0 watts

163. A copper wire of length l and diameter d has potential difference V applied at its two ends. The drift velocity is V_d. If the diameter of wire is made d/3, then drift velocity becomes

a. 9 V_d
b. V_d / 9
c. V_d /3
d. V_d

164. Heater is rated as 230V, 10kW, A.C. the value 230 V refers to

a. Average voltage
b. Rms voltage
c. Peak voltage
d. Maximum voltage

165. For a sine wave with peak value E_{max} the average value is

a. 0.636 E_{max}
b. 0.707 E_{max}
c. 0.434 E_{max}
d. 0.212 E_{max}

166. In case of unsymmetrical alternating current the average value must always be taken over
a. Unsymmetrical part of the waveform
b. The quarter cycle
c. The half cycle
d. The full cycle

167. Which of the following coil will have large resonant frequency
a. A coil with large resistance
b. A coil with low resistance
c. A coil with large distributed capacitance
d. A coil with low distributed capacitance

168. In A.C. circuits a low value of KVAR compared with kW indicates
a. Low efficiency
b. High power factor
c. Unity power factor
d. Maximum load current

169. The frequency of an alternating current is
a. The speed with which alternator runs
b. The number of cycles generated in one minute
c. The number of waves passing through a point in one second
d. The number of electrons passing through a point in one second

170. When an alternating current passes through an ohmic resistance the electrical power converted in to heat is
a. Apparent power
b. True power
c. Reactive power
d. Active and reactive power

171. A 100 kilo ohm resistor with a 1 W power rating is likely to be a
a. Carbon resistor
b. Wire wound resistor

c. Either carbon or wire wound resistor
d. Neither carbon nor wire wound resistor

172. Kirchhoff's laws are applicable to circuits with:
a. Distributed parameters
b. Lumped parameters
c. Passive elements
d. Non-linear resistances

173. An ideal current source has:
a. Zero internal conductance
b. Zero internal resistance
c. Zero voltage on no load
d. Zero ripple

174. Which of the following is correct:
a. Norton's equivalent resistance is the same as Thevenin's equivalent resistance
b. Norton's equivalent is the current equivalent of the network
c. The load is connected in parallel to the Norton's equivalent resistance and Norton's equivalent current source
d. All the answers

175. A Circuit of zero lagging power factor behaves as:
a. An inductive circuit
b. A capacitive circuit
c. R-L circuit
d. R-C circuit

176. The heat developed in an electric iron is attributed to __ power
a. Apparent
b. Reactive
c. True
d. True and reactive

177. In a circuit low reactive power compared to true power indicates:
a. Low power factor
b. High power factor
c. Low efficiency

d. High efficiency

178. superposition theorem can be applied only to circuits having
a. resistive elements
b. passive elements
c. non-linear elements
d. linear bilateral elements

179. An ideal voltage source should have
a. large value of emf
b. small value of emf
c. zero source resistance
d. infinite source resistance

180. To determine the polarity of the voltage drop across a resistor, it is necessary to know
a. value of current through the resistor
b. direction of current through the resistor
c. value of resistor
d. e.m.fs. in the circuit

181. Which of the following is non-linear circuit parameter?
a. inductance
b. condenser
c. wire wound resistor
d. transistor

182. A capacitor is generally a
a. bilateral and active component
b. active, passive and linear and nonlinear component
c. linear and bilateral component
d. non-linear and active component

183. A capacitor in the s-domain consists of
a. Current source CVo in parallel with the capacitor
b. Current source in series with capacitor
c. Voltage source Vo/s in parallel with capacitor
d. Voltage source CVo in parallel with capacitor

184. The driving point impedance is defined as

a. the ratio of transform voltage to transform current at the same port
b. the ratio of transform voltage at one port to transform current at the other port
c. both (a) and (b)
d. all answers are wrong

185. In describing the transmission parameters

a. The input voltage and current are expressed in terms of output voltage and current
b. The output voltage and current are expressed in terms of input voltage and current✓
c. The input voltage and output current are expressed in terms of output voltage and input current.
d. The input current and output voltage are expressed in terms of output voltage and input current.

186. Which type of parameters will be used in impedance matching networks

a. Z parameters✓
b. h parameters
c. T parameters
d. all answers are wrong

187. Impedance parameters are also called as

a. Y parameters
b. open circuit parameters✓
c. Short circuit parameters
d. all answers are wrong

188. To turn off sources, a ideal voltage source is replaced by a/an _____ and a ideal current source is replaced by a/an _____.

a. R=0 for both
b. R= ∞ for both
c. R=0 and R= ∞✓
d. R= ∞ and R=0.

189. A transfer function is defined only when all initial conditions are

a. Zero✓
b. One
c. Infinite
d. all answers are wrong

190. An inductor in s-domain consists of

a. Current source in series with an inductor
b. Current source in parallel with capacitor
c. Voltage source of LIo in series with an inductor✓
d. Current source of Io/s in series with an inductor

191. The transfer impedance is defined as

a. the ratio of transform voltage to transform current at the same port
b. the ratio of transform voltage at one port to the transform current at other port✓
c. both (a) and (b)
d. all the answers are wrong

192. Theorem used for reducing the given circuit with variable load is

a. Superposition
b. Maximum power transfer✓
c. Mesh
d. Nodal

193. Mesh analysis employs

a. KCL
b. KVL✓
c. both KVL and KCL
d. ohm's law

194. A node is the junction of more than _____ branches

a. 2
b. 3
c. 1✓
d. none of the above

195. The reciprocal of resistance is:

a. Voltage
b. Current
c. Conductance✓
d. coulombs

196. An electric heater draws 10 A from a 120-V line. The resistance of the heater is:

a. 1200Ω
b. 120 Ω
c. 12 Ω✓
d. 1.2 Ω

197. The voltage drop across a 1.5-kW toaster that draws 12 A of current is:

a. 18 kV
b. 125 V✓
c. 120 V
d. 10.42 V

198. The maximum current that a 2W, 80 kΩ resistor can safely conduct is:

a. 160 kA
b. 40 kA
c. 5 mA✓
d. 25 μA

199. The inductor stores energy in ----------.

a. Magnetic circuit✓
b. Electric circuit
c. Both
d. Electromagnetic circuit

200. When a circuit is said to be open circuit

a. V = 0
b. P = 0
c. I = 0✓
d. All of the above

201. How one can identify a series circuit

a. Voltage is same
b. Power is same
c. Current is same✓
d. None of the above

202. How one can identify a series circuit

a. Voltage is same

b. Power is same
c. Current is same✓
d. None of the above

203. A load is connected to a network. At the terminals to which the load is connected, R_{Th} = 10 Ω and V_{Th} = 40 V. The maximum power supplied to the load is:
a. 160 W
b. 80 W
c. 40 W✓
d. 1 W

204. When the total charge in a capacitor is doubled, the energy stored:
a. remains the same
b. is halved
c. is doubled
d. is quadrupled✓

205. If the current through a 10 mH inductor increases from zero to 2 A, how much energy is stored in the inductor?
a. 40 mJ
b. 20 mJ✓
c. 10 mJ
d. 5 mJ

206. A capacitor in an RC circuit with R = 2 ohm and C = 4 F is being charged. The time required for the capacitor voltage to reach 63.2 percent of its steady state value is:
a. 2 s
b. 4 s
c. 8 s✓
d. 16s

207. A network can be completely specified by:
a. Real parts of zeroes
b. Poles and zeroes
c. Real part of poles
d. Poles, zeroes and a scale factor✓

208. In a series RLC circuit, setting will produce:
a. an over damped response
b. a critically damped response

c. an under damped response✓
d. an undamped response

209. A series RC circuit has $|V_R|$ = 12 V and $|V_c|$=5 V. The magnitude of the supply voltage is:
a. - 7
b. 7 V
c. 13 V✓
d. 17 V

210. A quantity that contains all the power information in a given load is the
a. power factor
b. apparent power
c. average power
d. reactive power
e. complex power✓

211. The coefficient of coupling for two coils having L1 = 2 H, L2 = 8 H and M = 3H is:
a. 0.1875
b. 0.75✓
c. 1.333
d. 5.333

212. Which of these transformers can be used as an isolation device?
a. linear transformer
b. ideal transformer ✓
c. auto transformer
d. all of the above

213. In a series RLC circuit, which of these quality factors has the steepest magnitude response curve near resonance?
a. 20
b. 12
c. 8
d. 4✓

214. If one of the resistors in a parallel circuit is removed, what happens to the total resistance?
a. Decreases
b. Increases✓

c. Remains constant
d. Exactly doubles

215. If two resistors R1 and R2 are connected in parallel carry a total current of I, then current through R2 is

a. IR2 = I $\frac{R_2}{R_1 + R_2}$
b. IR2 = I $\frac{R_1 R_2}{R_1 + R_2}$
c. IR2 = I $\frac{R_1}{R_1 + R_2}$ ✓
d. IR1 = I $\frac{R_2}{R_1 + R_2}$

216. The following voltage drops are measured across each of the three resistors in series: 5.2 V, 8.5 V, 12.3 V. What is the value of source voltage to which these resistors are connected?

a. 8.2 V
b. 12.3 V
c. 5.2 V
d. 26 V✓

217. Identify the passive element among the following.

a. Voltage source
b. Current source
c. Inductor✓
d. Transistor

218. 100 W, 250 V lamp is connected in series with a 100 W, 200 V lamp across 250 V supply. Assume lamp resistance to remain unaltered. The circuit current is

a. 0.144 A
b. 0.244 A✓
c. 0.344 A
d. 0.444 A

219. Norton's equivalent circuit consists of

a. Voltage source in parallel with resistance
b. Voltage source in series with resistance
c. Current source in series with resistance

d. Current source in parallel with resistance✓

220. When superposition theorem is applied to any circuit, the voltage source in that circuit is always …….

a. Opened
b. Shorted✓
c. Active
d. None of the above

221. If 10 V battery is connected across the parallel resistors of 3 Ω, 5 Ω, 10 Ω and 20 Ω, how much voltage is there across 5 Ω resistor.

a. 3 V
b. 10 V✓
c. 5 V
d. 20 V

222. The Nodal method of circuit analysis is based on,

a. KVL and Ohms law
b. KCL and Ohms law✓
c. KVL and KCL
d. KVL, KCL and Ohms law

223. Two resistors 5 Ω and 3 Ω are connected in series with a voltage source of 20 V. What is the voltage drop across 3 Ω resistor?

a. 12.5 V
b. 20 V
c. 7.5 V✓
d. 8 V

224. The Thevenin equivalent voltage and Thevenin impedance for the circuit shown in Fig.1 is

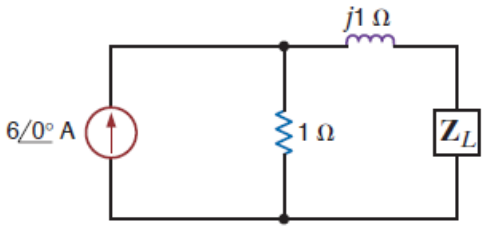


Fig.1

a. 6 V and 1+j1 Ω✓

b. 6 V and 1-j1Ω
c. j6 V and 1+j1 Ω
d. 6V and j1 Ω

225. The T-parameters of the L-network shown in Fig.1 are

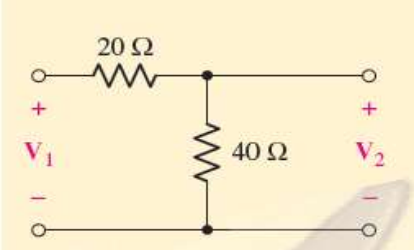


Fig.1

a. $\begin{bmatrix} 0.67 & 20 \\ 0.25 & 1 \end{bmatrix}$
b. $\begin{bmatrix} 1.5 & 20 \\ 0.025 & 1 \end{bmatrix}$ ✓
c. $\begin{bmatrix} 1.5 & 60 \\ 0.025 & 1 \end{bmatrix}$
d. $\begin{bmatrix} 1.5 & 40 \\ 60 & 1 \end{bmatrix}$

226. The magnitude of Voc1 in the circuit shown in Fig. 1 is

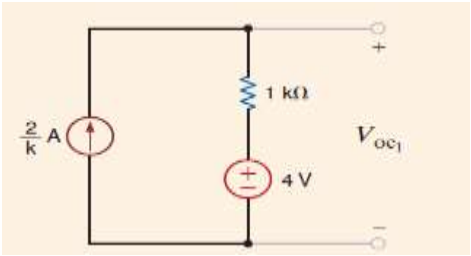


Fig.1

a. 2 V
b. 4 V✓
c. 6 V
d. -6 V

227. The voltage equivalent of an inductor with initial conditions

a. V(s)= sLI(s) +Li(0)
b. V(s)= sLI(s) - Li(0)✓
c. V(s)= sLI(s) +Lv(0)
d. V(s)= sLI(s) - Lv(0)

228. A source of angular frequency 1 rad/sec has source impedance consisting of 1Ω resistance in series with 1 H inductance. The load that will obtain the maximum power transfer is:

a. 1Ω resistance✓
b. 1Ω resistance parallel with 1H inductance
c. 1Ω resistance in series with 1F capacitor
d. 1Ω resistance in parallel with 1F capacitor

229. A two-port network is defined by the following pair of equations

$I_1 = 2V_1 + V_2$

$I_2 = V_1 + V_2$.

Its impedance parameters $Z_{11}, Z_{12}, Z_{21}, Z_{22}$ are given by

a. 2,1,1,1
b. 1,-1,-1,2✓
c. 1,1,1,2
d. 2,-1,-1,1

230. The transfer function Vo(s)/Vs(s) for the circuit in the Fig.1 is_____

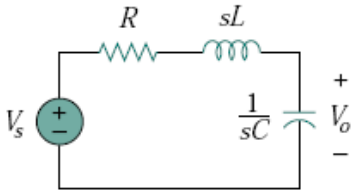


Fig.1

a. [1/LC]/(s2+s/RC+[1/LC])
b. [1/LRC]/(s2+s/LC+[1/LC])
c. [1/RC]/(s2+s/LC+[1/RC])
d. [1/LC]/(s2+[sR]/L+[1/LC])✓

231. For a single element two port network shown in Fig. 1. The parameter Z11 is_____.

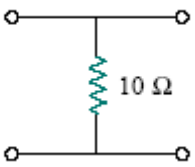


Fig. 1

a. 0

b. 10✓
c. 5
d. not existent

232. All the frequency components between two cut off frequency f1 and f2 are passed without attenuation

a. Low pass filter✓
b. Band pass filter
c. High pass filter
d. Band rejection filter

Power electronics

1. In a SCR based converter, the freewheeling diode is used to
   a) Add to the conduction current of thyristors
   b) Oppose the SCR conduction
   c) Conduct current during the OFF period of the SCR
   d) Protect the SCR by providing a shunt path✓

2. A single phase full - wave half controlled bridge converter feeds an inductive load. The two SCRs in the converter are connected to a common DC bus. The converter has to have a free wheeling diode
   a) because the converter inherently does not provide for free wheeling
   b) Because the converter does not provide for free wheeling for high values of triggering angles✓
   c) Or else the free wheeling action of the converter will cause shorting of the AC supply
   d) Or else if a gate pulse to one of the SCRs is missed, it will subsequently cause a high load current in the other SCR
3. Circuit turn-off time of an SCR is defined as the time
   a) Taken by the SCR to turn off
   b) Required for SCR current to become zero
   c) For which the SCR is reverse biased by the commutation circuit✓
   d) For which the SCR is reverse biased to reduce its current below the holding current

4. A single phase fully controlled thyristor bridge ac-dc converter is operating at a firing angle of 25 degree, and an overlap angle 10 degree with constant dc output current of 20A. The fundamental power factor (displacement factor) at input ac mains is
   a) 0.78✓
   b) 0.827
   c) 0.866
   d) 0.9
5. A three phase fully controlled thyristor bridge converter is used as line commutated inverter to feed 50 KW power at 420 V DC to a three phase 415V(line), 50Hz as mains. Consider Dc link current to be constant. The rms current of the thyristor is
   a) 119.05A
   b) 79.37A
   c) 68.73A
   d) 39.68A✓

6. A half-controlled single-phase bridge rectifier is supplying an R-L load. It is operated at a firing angle a and the load current is continuous. The fraction of cycle that the freewheeling diode conducts is
   a) 1 2/
   b) (1 – α)/π
   c) α)/2π
   d) (α)/π ✓

7. The typical ratio of latching current to holding current in a 20 A thyristor is
   (A) 5.0
   (B) 2.0 ✓
   (C) 1.0
   (D) 0.5

8. An SCR is considered to be a semi-controlled device because
   (A) It can be turned OFF but not ON with a gate pulse.
   (B) It conducts only during one half-cycle of an alternating current wave.
   (C) It can be turned ON but not OFF with a gate pulse.✓
   (D) It can be turned ON only during one half-cycle of an alternating voltage wave

9. A 3-phase voltage source inverter is operated in 180 degree conduction mode. Which one of the following statements is true ?
   (A) Both pole-voltage and line-voltage will have 3rd harmonic components
   (B) Pole-voltage will have 3rd harmonic component but line-voltage will be free from 3rd harmonic
   (C) Line-voltage will have 3rd harmonic component but pole-voltage will be free from 3rd harmonic
   (D) Both pole-voltage and line-voltage will be free from 3rd harmonic components✓

10. A single phase fully controlled bridge converter supplies a load drawing constant and ripple free load current, if the triggering angle is 30 degree , the input power factor will be
    (A) 0.65
    (B) 0.78 ✓
    (C) 0.85
    (D) 0.866

11. A three phase fully controlled bridge converter is feeding a load drawing a constant and ripple free load current of 10 A at a firing angle of 30 degree . The approximate Total harmonic Distortion (%THD) and the rms value of fundamental component of input current will respectively be

(A) 31% and 6.8 A
(B) 31% and 7.8 A ✓
(C) 66% and 6.8 A
(D) 66% and 7.8 A

12. A single-phase fully controlled thyristor bridge ac-dc converter is operating at a firing angle of 25 degree and an overlap angle of 10 degree with constant dc output current of 20 A. The fundamental power factor (displacement factor) at input ac mains is
(A) 0.78 ✓
(B) 0.827
(C) 0.866
(D) 0.9
13. A three-phase, fully controlled thyristor bridge converter is used as line commutated inverter to feed 50 kW power 420 V dc to a three-phase, 415 V(line), 50 Hz ac mains. Consider dc link current to be constant. The rms current of the thyristor is
(A) 119.05 A
(B) 79.37 A
(C) 68.73 A
(D) 39.68 A✓
14. A single phase full-wave half-controlled bridge converter feeds an inductive load. The two SCRs in the converter are connected to a common DC bus. The converter has to have a freewheeling diode.
(A) because the converter inherently does not provide for free-wheeling
(B) because the converter does not provide for free-wheeling for high values of triggering angles✓
(C) or else the free-wheeling action of the converter will cause shorting of the AC supply
(D) or else if a gate pulse to one of the SCRs is missed, it will subsequently cause a high load current in the other SCR.
15. "Six MOSFETs connected in a bridge configuration (having no other power device) must be operated as a Voltage Source Inverter (VSI)". This statement is
(A) True, because being majority carrier devices MOSFETs are voltage driven.
(B) True, because MOSFETs hav inherently anti-parallel diodes
(C) False, because it can be operated both as Current Source Inverter (CSI) or a VSI
(D) False, because MOSFETs can be operated as excellent constant current sources in the saturation region✓

16. The conduction loss versus device current characteristic of a power MOSFET is best approximated by
(A) a parabola ✓
(B) a straight line
(C) a rectangular hyperbola
(D) an exponentially decaying function

17. A three-phase diode bridge rectifier is fed from a 400 V RMS, 50 Hz, three-phase AC source. If the load is purely resistive, then peak instantaneous output voltage is equal to
    A) 400 V
    B) 400 √2 V✓
    C) 400 √2/3 V
    D) 400/(√3) V
18. The output voltage waveform of a three-phase square-wave inverter contains
    (A) only even harmonics
    (B) both odd and even harmonic
    (C) only odd harmonics ✓
    (D) only triple harmonics
19. AC power in a load can be controlled by using
    a. two SCR's in parallel opposition✓
    b. two SCR's in series
    c. three SCR's in series
    d. four SCR's in series
20. An SCR is made up of silicon because
    a. silicon has large leakage current than germanium
    b. silicon has small leakage current than germanium✓
    c. silicon has small leakage voltage than germanium
    d. silicon has large leakage voltage than germanium
21. When a line commutated converter operates in the inverter mode
    (a) It draws both real and reactive power from the AC supply
    (b) It delivers both real and reactive power to the AC supply
    (c) It delivers real power to the AC supply✓
    (d) It draws reactive power from the AC supply
22. A chopper operating at a fixed frequency is feeding an RL load. As the duty ratio of the chopper is increased from 25% to 75%, the ripple in the load current is
    a) Remains constant✓
    (b) Decreases, reaches a minimum at 50% duty ratio and then increases
    (c) Increases, reaches a maximum at 50% duty ratio and then decreases
    (d) Keeps on increasing as the duty ratio is increased
23. To turn off a SCR, the reverse bias should be applied for a period ..... the turn-off time of the SCR
    (a) Equal to
    (b) Longer than✓
    (c) Less than
    (d) Irrespective of

24. In class A and class B commutation the resonating circuit has to be
    (a) Over damped
    (b) Critically damped

(c) Under damped✓
(d) Negatively damped

25. The controlling parameter in MOSFET is
a) Vds
b) Ig
c) Vgs✓
d) Is

26. Comparing with the full wave rectifier using two diodes, the four diode bridge rectifier has the dominant advantage of
(a) Higher current carrying
(b) Lower peak inverse voltage requirement✓
(c) Lower ripple factor
(d) Higher efficiency

27. A SCR is rated at 75A peak, 20A average. The greatest possible delay in the trigger angle if the dc is at rated value is
(a) 47.5°
(b) 30° to 45°✓
(c) 74.5°
(d) 137°

28. A sine voltage of 200Vrms, 50Hz is applied to an SCR through 100ohm resistor. The firing angle is 60°. Consider no voltage drop. The output voltage in rms is
(a) 89.7 V
(b) 126.7 V✓
(c) 166.7 V
(d) 200√2 V

29. The cycloconverter require natural or forced commutation as under

(a) Natural commutation in both step-up and step down cycloconverter
(b) Forced commutation in both step-up and step-down cycloconverter
(c) Forced commutation in step-up cycloconverter✓
(d) Forced commutation in step-down cycloconverter

30. In synchronized UJT triggering of an SCR, voltage VC across capacitor reaches UJT threshold thrice in each half cycle so that there are three firing pulses during each half cycle. The firing angle of the SCR can be controlled
(a) Once in each half cycle✓
(b) Thrice in each half cycle
(c) Twice in each half cycle
(d) Four times in each half cycle
(e) None of the above

31. Six MOSFETs connected in a bridge configuration (having no other power device) MUST be operated as a Voltage Source Inverter (VSI) ". This statement is
A. True, because being majority carrier devices, MOSFETs are voltage driven
B. True, because MOSFETs have inherently anti parallel diodes
C. False, because it can be operated both as current source Inverter (CSI) or a VSI

D. False, because MOSFETs can be operated as excellent constant current sources in the saturation region✓

32. A single phase full - wave half controlled bridge converter feeds an inductive load. The two SCRs in the converter are connected to a common DC bus. The converter has to have a free wheeling diode
    A. because the converter inherently does not provide for free wheeling
    B. Because the converter does not provide for free wheeling for high values of triggering angles✓
    C. Or else the free wheeling action of the converter will cause shorting of the AC supply
    D. Or else if a gate pulse to one of the SCRs is missed, it will subsequently cause a high load current in the other SCR
33. The manufacturer of a selected diode gives the rate of fall of the diode current di/dt = 20 A/ms, and a reverse recovery time of trr =5 ms. What is value of peak reverse current?
    A. 44.72A✓
    B. 42.14 A
    C. 22.36 A
    D. 32.64 A
34. Circuit turn-off time of an SCR is defined as the time
    A. Taken by the SCR to turn off`
    B. Required for SCR current to become zero
    C. For which the SCR is reverse biased by the commutation circuit
    D. For which the SCR is reverse biased to reduce its current below the holding current✓

35. The reverse recovery time of the diode is defined as the time between the instant diode current becomes zero and the instant reverse recovery current decays to
    (a) Zero
    (b) 10% of the reverse peak current (I_{RM})
    (c) 25% of (I_{RM})✓
    (d) 15% of (I_{RM})
36. The cut-in voltage and forward-voltage drop of the diode are respectively
    (a) 0.7V, 0.7V✓
    (b) 0.7V, 1V
    (c) 0.7V, 0.6V
    (d) 1V, 0.7V
37. Compared to Power MOSFET, the Power BJT has
    (a) Lower switching losses but higher conduction loss
    (b) Higher switching losses and higher conduction loss
    (c) Higher switching losses but lower conduction loss✓
    (d) Lower switching losses and lower conduction loss

38. In a 3 phase fully controlled converter the firing frequency is
    A. 3 times the line frequency
    B. 6 times the line frequency✓
    C. 9 times the line frequency
    D. 12 times the line frequency
39. Two thyristor of same rating and same specifications
    A. will have equal turn on and turn off periods
    B. will have equal turn on but unequal turn off periods
    C. may have equal or unequal turn on and turn off periods✓
    D. will have unequal turn on and turn off periods
40. An RC snubber circuit is used to protect a thyristor against
    A. false triggering
    B. failure to turn on
    C. switching transients✓
    D. failure to commutate
41. A single phase semiconverter has a freewheeling diode. If the firing angle is a and the load is purely resistive, the periods of conduction and freewheeling respectively are
    A. p - a and 0✓
    B. p - a and a
    C. p + a and 0
    D. p + a and a

42. A single phase half wave controlled rectifier circuit has an R-L load. A freewheeling diode is also in the circuit. When freewheeling diode is conducting the SCR
    A. is forward biased
    B. is reverse biased✓
    C. may be forward biased or reverse biased
    D. forward biased initially but reverse biased afterwards
43. A 750 A circuit uses thyristor of current rating 175 A. If derating is 25%, the number of thyristors in parallel is
    A. 3
    B. 4
    C. 6✓
    D. 10
44. In a semi converter feeding a resistive load
    A. the wave shapes of output voltage and output current are exactly similar✓
    B. the wave shapes of output voltage and output current can not be similar
    C. the wave shapes of output voltage and output current are similar only for low values of firing angle
    D. the wave shapes of output voltage and output current may be similar or dissimilar
45. In a 3 phase semi converter, the output voltage becomes discontinuous for
    A. firing angle > 30°

B. firing angle > 60°✓
C. firing angle > 90°
D. firing angle > 120°

46. A fully controlled bridge converter feeds a highly inductive load such that the load current can be assumed to be constant. The wave shape of input current is
A. dc
B. sinusoidal
C. rectangular✓
D. Triangular
47. A static excitation system uses
A. transformer and thyristors✓
B. transformer and ac exciter
C. dc exciter and ac exciter
D. transformer and dc exciter
48. The power factor at the input terminals of a cyclo- converter is generally
A. low and leading
B. low and lagging✓
C. high and leading
D. high and lagging

49. In a 3 phase bridge inverter, the gating signals for the three phases have a phase difference of
A. 120°✓
B. 60°
C. 240°
D. 45°
50. The number of leads in a DIAC are
A. 2✓
B. 3
C. 4
D. 6
51. An ideal rectifier should have
A. 100% efficiency, zero ripple factor, zero harmonic factor and unity displacement factor✓
B. 100% efficiency, zero tipple factor, zero harmonic factor and zero displacement factor
C. 100% efficiency, zero ripple factor, unity harmonic factor and unity displacement factor
D. 100% efficiency, unity ripple factor, zero harmonic factor and unity displacement factor
52. In a single phase half wave ac regulator feeding a resistive load, the rms load current
A. is always positive✓
B. may be positive or negative
C. is always negative

D. can be even zero

53. In a modified series inverter with two inductors and two capacitors, the load current
    A. has 2 parallel paths✓
    B. has only one parallel path
    C. can have three parallel paths
    D. has four parallel paths
54. A dc series motor is coupled to a load whose torque is proportional to speed. It is fed by a single phase ac supply through a full converter. When speed is 500 rpm, firing angle is 45°. It is desired to raise the speed. It will be necessary to
    A. decrease the firing angle✓
    B. increase the firing angle
    C. either decrease or increase the firing angle depending on the required speed
    D. decrease the load torque

55. As compared to a p-n junction diode
    A. a schottky diode has lower cut in voltage and lower reverse saturation current
    B. a schottky diode has higher cut in voltage and higher reverse saturation current
    C. a Schottky diode has lower cut in voltage and higher reverse saturation current✓
    D. a schottky diode has higher cut in voltage and lower reverse saturation current
56. A single phase half wave rectifier circuit has a free wheeling diode. The free wheeling diode will conduct only if
    A. load is purely resistive
    B. load is purely inductive
    C. load is combination of R and L
    D. load is purely inductive or combination of R and L✓
57. The characteristics of which device has peak point and valley point
    A. SCR
    B. PUT✓
    C. SCS
    D. Shockley diode
58. In a 3 phase full converter, the firing angle is less than 60°. The instantaneous output voltage
    A. will have positive part only✓
    B. will have both positive and negative parts
    C. may have both positive and negative parts
    D. will have negative part if load is inductive
59. If gate current is increased, the anode-cathode voltage at which SCR closes is.....
    (a) Increased
    (b) Decreased✓
    (c) Maximum

(d) Least

60. Which of these commutation methods uses an external pulse for commutation?
    A. Class A
    B. Class C
    C. Class E✓
    D. Class F
61. A cycloconverter can be
    A. step down
    B. step up
    C. step down or step up✓
    D. none of the above

62. In a 3 phase fully controlled converter the firing frequency is
    A. 3 times the line frequency
    B. 6 times the line frequency✓
    C. 9 times the line frequency
    D. 12 times the line frequency
63. Two thyristor of same rating and same specifications
    A. will have equal turn on and turn off periods
    B. will have equal turn on but unequal turn off periods
    C. may have equal or unequal turn on and turn off periods✓
    D. will have unequal turn on and turn off periods
64. The amount of dielectric heating is inversely proportional to frequency.
    A. True
    B. False ✓
65. A semiconverter feeding an RLE load operates in
    A. first quadrant only✓
    B. first and second quadrants
    C. first and fourth quadrants
    D. first and third quadrants
66. The phenomenon of overlap in converter operation due to
    A. source resistance
    B. source inductance✓
    C. both source resistance and source inductance
    D. high value of firing angle
67. For a 12 pulse operation, the two 6 pulse units are fed by
    A. Y - Y and Y - Y transformers
    B. Δ - Δ and Δ - Δ transformers
    C. Y - Y and Y - Δ transformers✓
    D. Y - Δ and Y - Δ transformers

68. In a single phase full wave converter (M - 2 connection) feeding a highly inductive load, the firing angle for each thyristor is a in the respective half cycle. The period of conduction of each thyristor is
    A. p - a
    B. p✓
    C. p + a
    D. p - 2a

69. An SCR is triggered at 40° in the positive half cycle only. The average anode current is 50 A. If the firing angle is changed to 80°, the average anode current is likely to be
    A. 50 A
    B. 25 A
    C. less than 50 A but more than 25 A✓
    D. less than 25 A
70. In a step down chopper using pulse width modulation, Ton = 3 x 10-3 and Toff = 1 x 10-3 s. The chopping frequency is
    A. 333.33
    B. 250✓
    C. 500
    D. 1000
71. Thyristors are suitable for dc circuit breakers but not for ac circuit breakers.
    A. True
    B. False✓
72. The value of capacitor C for dynamic equalizing circuit of series connected thyristors is determined by
    A. forward characteristics of thyristors
    B. reverse recovery characteristics of thyristors✓
    C. both forward and reverse recovery characteristics of thyristors
    D. none of the above
73. A chopper
    A. converts constant voltage dc into ac and then into variable voltage dc
    B. converts constant voltage dc into variable voltage dc directly✓
    C. converts ac of one frequency into ac of another frequency
    D. converts ac to dc
74. Assertion (A): If the duty cycle of chopper is low the current would not become discontinuous
    Reason (R): If the time constant L/R of the load in chopper is low the current may become discontinuous.

    A. Both A and R are correct and R is correct explanation of A
    B. Both A and R correct but R is not correct explanation of A

C. A is correct but R is wrong✓
D. A is wrong but R is correct

75. In a single phase full wave regulator, the firing angles in the positive and negative half cycles are generally
    A. equal✓
    B. different
    C. equal or different
    D. different but sometimes equal
76. An electric heater is controlled by thyristors through on-off control. If a = 0.4, the heating is
    A. 16% maximum
    B. 40% of maximum✓
    C. 60% of maximum
    D. 84% of maximum
77. The terminals of a power BJT are called
    A. emitter, base, collector✓
    B. emitter, base, drain
    C. source, base, drain
    D. source, base, collector
78. In single phase half wave regulator, the average current over one full cycle
    A. is always positive
    B. may be positive or negative
    C. may be negative
    D. is always negative✓
79. The dynamic equalising circuit consists of a series combination of capacitor C and resistor RC across each thyristor. This resistance RC (along with parallel connected diode)
    A. limits charging current
    B. limits discharging current✓
    C. limits both charging and discharging currents
    D. none of the above
80. A single phase semi converter is feeding a highly inductive load and has freewheeling diode across the load. The wave shapes of output voltage and output current
    A. are similar
    B. are not similar✓
    C. may be similar or dissimilar
    D. are similar only if firing angle is zero
81. Current derating may be necessary when thyristors are operating in
    A. series

B. parallel✓
C. series or parallel
D. none of the above

82. Assertion (A): Power transistor has lower switching time than SCR
Reason (R): Power transistor has greater switching time than SCR

A. Both A and R are correct and R is correct explanation of A
B. Both A and R correct but R is not correct explanation of A
C. A is correct but R is wrong
D. A is wrong but R is correct✓

83. A 3 kV circuit uses SCR of 800 V rating. If derating is 25%, the number of SCRs in series is
A. 4
B. 5✓
C. 6
D. 8

84. In a circuit using a full wave converter (M - 2 connection) the PIV of each thyristor is 400 V. For the same output voltage and fully controlled bridge converter, PIV will be
A. 400 V
B. 800 V
C. 200 V✓
D. 2002 V

85. In a multiphase chopper, all choppers operate together.
A. True
B. False✓

86. The terminals of a power MOSFET are called
A. emitter, base, collector
B. source, gate, drain✓
C. source, base, drain
D. emitter, gate, drain

87. Assertion (A): The surge current which an SCR can withstand is much higher than rms on state current.
Reason (R): The duration of surge current is very small.

A. Both A and R are correct and R is correct explanation of A✓
B. Both A and R correct but R is not correct explanation of A
C. A is correct but R is wrong
D. A is wrong but R is correct

88. Assertion (A): A transistor requires a continuous base signal for conduction but a thyristor requires a gate pulse.

Reason (R): Transistor find widespread application in power electronic circuits.

A. Both A and R are correct and R is correct explanation of A
B. Both A and R correct but R is not correct explanation of A
C. A is correct but R is wrong✓
D. A is wrong but R is correct

89. In a thyristor the gate current is increased, then
A. anode current will increase
B. anode current will decrease
C. anode current will remain constant✓
D. anode current may increase or decrease

90. Thyristors are not suitable for logic circuits.
A. True
B. False✓

91. The number of leads in an SCR are :
A. 2
B. 3✓
C. 4
D. 5

92. An SCR is considered to be semi controlled device. Because
(A) It can be turned OFF but not turned ON with gate pulse
(B) It conducts during only one half cycle of an alternating current wave
(C) It can be turned ON but not turned OFF with a gate pulse✓
(D) It can be turned ON only during only one half cycle of an alternating voltage wave

93. Which of the following does not cause permanent damage to SCR?
(A) high current ✓ (B) high rate of rise of current
(C) high temperature rise (D) high rate rise of voltage

94. What is a TRIAC?
(A) Two thyristors connected in parallel mode
(B) Two thyristors connected in series mode
(C) Two thyristors connected in anti parallel mode✓
(D) Two transistors connected in anti parallel mode

95. During forward blocking state, a thyristor is associated with
(A) low current, large voltage✓ (B) large current, low voltage
(C) medium current, large voltage (D) low current, medium voltage

96. Once SCR starts conducting a forward current, its gate loses control over
(A) anode circuit voltage only (B) anode circuit current only
(C) anode circuit voltage and current✓ (D) anode circuit voltage, current and time

97. As compared to power MOSFET, a BJT has

(A) lower switching losses but higher conduction loss
(B) higher switching losses and higher conduction loss
(C) higher switching losses and lower conduction loss✓
(D) lower switching losses and lower conduction loss

98. Which of the following device is not current triggered device?
(A) Thyristor (B) GTO (C) TRIAC (D) MOSFET✓

99. What is the average on state current for 60° conduction angle where in the average on state current for an SCR is 20 A for conduction angle of 120°
(A) 20 A (B) 25 A (C) 40 A (D) < 20 A✓

100. The average on state current for an SCR is 20 A for a resistive load. If an inductance of 5 mH is included in the load, then average on state current would be
(A) more than 20 A (B) less than 20 A (C) 15 A (D) 20 A

101. For an SCR with turn on time of 5 μs, an ideal trigger pulse should have
(A) short rise time with pulse width = 3 μs (B) long rise time with pulse width = 6 μs
(C) short rise time with pulse width = 6 μs (D) long rise time with pulse width = 3 μs

102. The main advantage of IGBT over SCR in power electronics is
(A) Reduced weight (B) Self commutating capability
(C) Very high reliability (D) Self cooling property

103. When cathode of thyristor made more positive than its anode
(A) all the junctions are forward biased
(B) Outer junctions are reverse biased and central one is forward biased
(C) Outer junctions are forward biased and central one is reverse biased
(D) All the junctions are reverse biased

104. A pure inductor is connected to 1–ϕ sinusoidal source through a diode. Conduction angle for diode is
(A) 90° (B) 180° (C) 270° (D) 360°

105. A single phase diode rectifier supplies a highly inductive load. The load current can be assumed to be ripple free. The ac supply side current waveform will be
(A) Sinusoidal (B) constant dc (C) square (D) triangular

106. A 3 – ϕ half wave diode rectifier feeds a load of R = 100 Ω. For an input of 400 V, 50 Hz, the power delivered to the load is
(A) 753.73 W (B) 974.23 W (C) 376.98 W (D) 487.26 W

107. What is the maximum output voltage of three phase full bridge rectifier supplied with a line voltage of 420 V?
(A) 401.1 V (B) 567.2 V (C) 498 V (D) 532 V

108. The advantage of using freewheeling diode with bridge type ac to dc converter is
(A) regenerative braking (B) reliable speed control
(C) improved power factor (D) reduced cost of the system

109. A chopper can be used on
(A) pulse width modulation only (B) frequency modulation only
(C) amplitude modulation only (D) both PWM and FM

110. A chopper circuit is operating TRC principle at a frequency of 2 kHz on a 220 V dc supply. If the load voltage is 170 V, then the conduction period of thyristor in each cycle is

(A) 3.86 ms (B) 7.72 ms (C) 0.772 ms (D) 0.386 ms

111. An inverter converts

(A) dc voltage to variable dc voltage (B) ac voltage to dc voltage
(C) dc voltage to ac voltage of constant frequency
(D) dc voltage to ac voltage of variable frequency

112. A single phase voltage source inverter feeds pure inductive load. The waveform of the load current will be

A) sinusoidal (B) rectangular (C) trapezoidal (D) triangular

113. In a single pulse modulation of PWM inverters, the pulse width is 120°, for an input voltage of 220 V dc, the RMS value of output voltage is

(A) 179.63 V (B) 254.04 V (C) 127.02 V (D) 185.04 V

114. A PWM switching scheme is used in single phase inverters to

(A) reduce the total harmonic distortion with modest filtering
(B) minimize the load on the dc side
(C) increase the life of batteries
(D) reduce lower order harmonics and increase higher order harmonics

115. A three phase full bridge VSI delivers power to a resistive load from a 450 V dc source. For a
star connected resistive load of 10 Ω/ph. Find the rms value of the load current under 180° conduction mode

(A) 18.708 A (B) 13.23 A
(C) 18.371 A (D) 21.213 A

116. Triacs cannot be used in ac voltage regulators for

(A) resistive load (B) back emf load
(C) inductive load (D) resistive inductive load

117. If gate current is increased, the anode-cathode voltage at which SCR turned on is

(a) Increased (b) Decreased (c) Maximum (d) Least

118. The thyristor has holding current of 150mA.when it was turned ON, the load resistance was at low value. Now if R is progressively increased, at what value of R (in Ω) will the thyristor turn OFF? The applied voltage is 300V.

(a) 2001 (b) 2005 (c) 2000 (d) 1200

119. Thyristor works on

(a) positive feedback (b) negative feedback (c) both (d) none

120. Input Ripple for buck and boost converters

(a).). Low; High (b) High; Low (c.) Same (d). Depends on L value

121. Match the following

a. 1Ø full converter (3*1.732Vm/Π)* Cos α (1)
b. 3Ø half wave converter (Vm/Π)*(1+cosα) (2)

c. 1Ø semi converter (3*1.732Vm/2Π)* Cos α (3)
d. 3Ø full converter (2 Vm/Π)* Cosα (4)

122. A dc separately excited motor has constant field current. The armature is fed from a single phase supply through a full converter. When α = 0, speed is 500 rpm. If α= 45°, the speed is likely to be
(a)354 rpm (b). 250 rpm (c.) 175 rpm (d) 125 rpm

123. In a 3 phase fully controlled converter the firing frequency is
(a) 3* fs (b) 6* fs (c) 9* fs (d) 12* fs

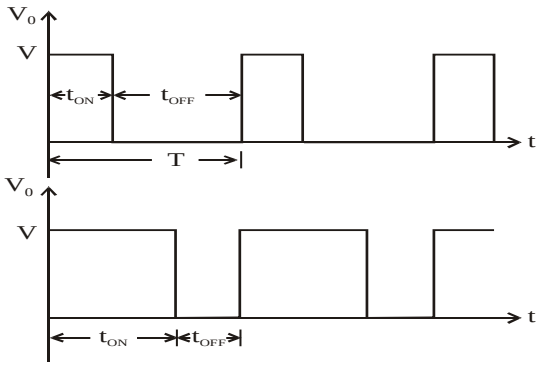
124. Speed of induction motor is controlled by its stator voltage, which power converter is used for varying the stator voltage
a. Stator voltage control b. Inverter c. Chopper d .Rectifier

125. In single phase half bridge inverter feeding R-L load, the energy is feed back to the source by
a. Diode b. Freewheeling diode c. feedback diode d.none

126. Industrial applications of inverter
a. Induction heating b. UPS c. Variable DC Drives d.both a & b.

127. Ac voltage regulator feeding purely inductive load. What will be the minimum firing angle to trigger thyristor?
(a) 0° (b) 45° (c) 90° (d) all

128. The figure shown below indicate ----------control

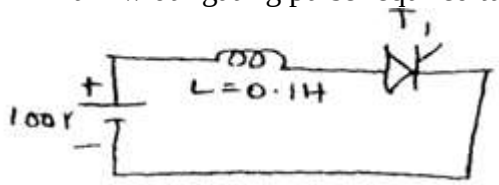


(a) Constant frequency (b) Variable frequency (c) Pulse width modulation (d) both a and

129. A chopper controlled electric train is powered from a 1500 V DC supply. The power semiconductor switching element has a minimum effective ON time of 40 µs .During starting and slow speed running, the output of the chopper has to go as low as 15 V. What is the highest chopper frequency possible to satisfy this requirement?

(a) 220 Hz (b) 250 Hz (c) 210 Hz (d) 245 Hz

130. The thyristor in figure below has a latching current of 4 mA; obtain the minimum width gating pulse required turn to properly turn ON SCR.



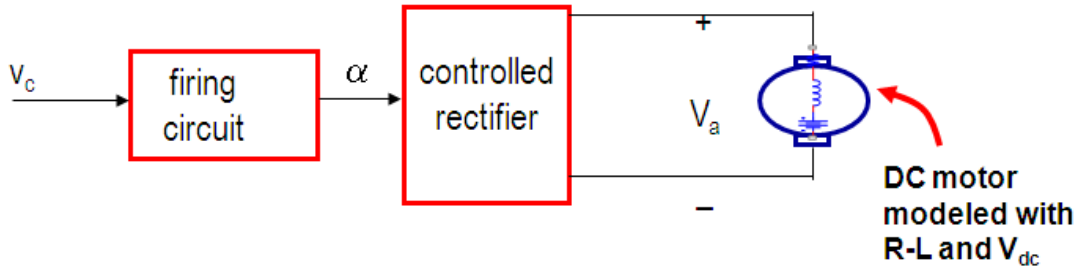
(a) 4 µS (b) 3 µs (c) 4.5µs (d) 5µS

131. An electromagnet is modeled as a 100-mH inductance in series with a 5Ω resistance and it is fed by single phase fully controlled converter. The average current

in the inductance must be 10 A to establish the required magnetic field, the load current is continuous or discontinuous?

(a) Continuous (b) Discontinuous (c) continuous and discontinuous (d) None

132. A single phase semi converter with freewheeling diode is used to control the speed of the given d.c motor as shown in figure given below. Write the speed expression with Va



(a) (Vm/Π)*(1+cosα) (b) (2 Vm/Π)* Cosα (c) (3*1.732Vm/2Π)* Cos α (d) (3*1.732Vm/Π)* Cos α

133. In single pulse modulation of PWM inverter,third harmonic content can be eliminated if pulse width is equal to

(a) 30° (b) 60° **(c) 120°** (d) 150°

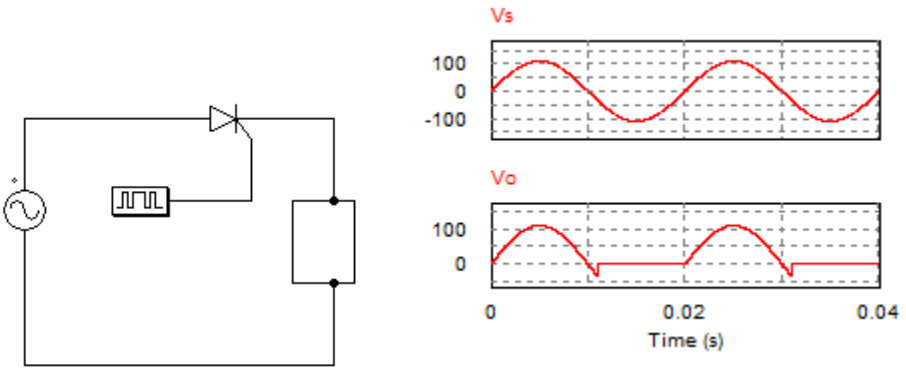
134. A single phase voltage source inverter has pure L as the load. For a constant source voltage,the current through an inductor is

(a) Square **(b) Sine** (c) Triangular (d) Pulsed

135. A single phase voltage source inverter has pure L as the load. For a constant source voltage,the current through an inductor is

(a) Square **(b) Sine** (c) Triangular (d) Pulsed

With reference to the figure given below, the type of load which is used here is ……



(a) Inductive load (b) resistive load **(c) RL load** (d) capacitive load

136. SCR will suffer from reverse recovery current when the switching frequency is

(a) High (b) Low (c) never suffer (d) moderate

137. In single phase half bridge inverter feeding R-L load, the energy is feed back to the source by

a. Diode **b. Freewheeling diode** c. feedback diode d.none

138. Industrial applications of inverter

a. Induction heating b. UPS c. Variable DC Drives **d.both a & b**

139. The disadvantage of variable frequency control is

(a) filtering requirement is more (b) filtering requirement is less (c) cannot vary Ton

(d) none

140. In buck converter the input ripple is

a. high **(b) low** (c) nil (d) half of the load current

141. Cycloconverter requires natural commutation in

a. Step up (b) step down (c) both (d) none

142. In 3 phase half converter the output voltage pulsates at a frequency equal to

a. f (b) 2f **(c) 3f** (d) 6f

143. Effect of source inductance is

a. Less harmonics (b) increase in output voltage (c) good p.f **(d) reduction in average output voltage**

144. In a series connected thyristors string, a thyristor having lower leakage resistance will block

(a). voltage (b) More voltage **(c) same as other thyristors** (d) string voltage

145. A dc separately excited motor has constant field current. The armature is fed from a single phase supply through a semi- converter. When $\alpha = 0$, speed is 650 rpm. If $\alpha = 90°$, the speed is likely to be?

(a). 1200 rpm (b) 650 rpm (c) 325 rpm (c) 175 rpm

146. A single-phase full-bridge voltage-source inverter feeds a purely inductive load. The inverter is operated in square-wave mode with a frequency of 50 Hz. If the average load current is zero, what is the time duration of conduction of each feedback diode in a cycle?

(a) 5 msec (b) 10 msec (c) 20 msec **(d) 2.5 msec**

147. SCR is a----------device

a) minority carrier b) majority carrier c) All answers are wrong

148. TRIAC is a---------- switch

a) Bidirectional b) Unidirectional c) three directional d) none

149. The SCR is turned on when the anode current reaches above the

a) Forward current rating b) Break over voltage

c) Holding current d) Latching current

150. In an SCR circuit the angle of conduction can be changed by changing

a) anode current b) anode voltage

c) forward current **d) gate current**

151. An ideal switch can conduct current in _____ directions. While a power transistor conducts current in _____ direction

a) one, two b) two, one **c) one, one** d) two, two

152. In the Quasi saturation region of BJT which statement is false

a) Drift region is fully saturated b) can be used for higher switching speeds

a) Drift region is not fully saturated b) Turn off time is lesser

153. Inverter grade thyristors have _____ turn off time compared to a converter grade thyristor.

a) Slower b) faster c) equal d) All answers are wrong

154. MOSFET is ----------

a) an uncontrollable switch b) a partially controllable switch

c) current controlled device d) a fully controllable switch

155. Calculate the number of SCRs required in a series string of voltage rating 7.5kV. The individual rating of the SCR is 500V, 75A and the voltage derating factor is 14%.

a) 26 b)10 **c)18** d)6

156. From the input side the IGBT behaves essentially as a _____.

a) MOSFET b) thyristor c) BJT d) All answers are wrong

157. A Thyristor is in the forward blocking state. Then

a) all the three junctions are reverse biased

b) the anode and cathode junctions are forward biased but the gate junction is reverse biased

c) the anode junction is forward biased but the other two , cathode and gate junctions are reverse biased.

d) The anode and gate junctions are forward biased but the cathode junction I is reverse biased.

158. Equalizing Circuits are provided across each SCR in series operation to provide uniform

a) Current Distribution **b) Firing of SCRs** c) Voltage Distribution d) All answers are wrong

159. To Turn off a Thyristor , the reverse bias should be applied for a period that is

a) Equal to the turn off time of the thyristor b) Longer than the turn off time of the thyristor c) Less than the turn off time of the thyristor d) Irrespective of the turn

160. SCR is the solid state equivalent of **(Gas Filled Triode)**

a) Transistor **b) Thyratron** c) Vacuum diode d) Crystal diode

161. With gate open , if the supply voltage exceeds the break over voltage of SCR ,then SCR will conduct

a) False **b) True** c) For dc d) For ac

162. A triac and SCR are compared

a) Both are unidirectional devices **b) both are two terminal devices**

c) Triac is bidirectional and SCR is unidirectional d) All answers are wrong

163. The snubber circuit basic design expression is given by

a) $= 0.632Vs / \tau$ b) $= 0.632Vs / \tau$ c) $= 0.632Vs / f$ **d) All answers are wrong**

164. The main cause of the second breakdown in power BJT is

a) Existence of drift layer b) Low thickness of base **c) All answers are wrong (current crowding and negative temperature coefficient of resistivity)**

165. A single phase half wave controlled rectifier has 400 sin 314t volts as input voltage and supplies a resistive load. For the firing angle of 60° for the SCR, the average output voltage is

a) $400/\pi$ **b) $300/\pi$** c) $240/\pi$ d) $360/\pi$

166. A freewheeling diode is placed across the DC load

a) to prevent reversal of load voltage b) to transfer the load current away from source

c) both (a) and (b) above d) All answers are wrong

POWER SYSTEMS

Comprehensive Viva- Multiple Choice Questions

1	Which of the following regulation is considered to be the best	
	A	**2%**
	B	30%
	C	70%
	D	98%.
2	When the power is to be transmitted over a distance of 500 km, the transmission voltage should be in the range	
	A	33 kV
	B	66 kV
	C	110 kV
	D	150kV
3	In order to reduce skin effect at UHF	
	A	conductors are painted
	B	conductors are anodized
	C	copper lubes with silver plating are used
	D	copper rods with silver plating are used.
4	When two conductors each of radius r are at a distance D, the capacitance between the two is proportional to	
	A	$\log_e (D/r)$
	B	$\log_e (r/D)$
	C	$1/\log_e (D/r)$
	D	$1/\log_e (r/D)$.
5	The fault clearing time of a circuit breaker is usually	
	A	few minutes
	B	few seconds
	C	one second
	D	few cycles of supply voltage.
6	Which of the following is not a type of the contactor for circuit breakers ?	
	A	Electro-magnetic
	B	Electro-pneumatic
	C	Pneumatic
	D	Vacuum.

7	The pressure of SF_6 gas in circuit breakers is of the order of	
	A	100 mm Hg
	B	1 kg/cm^2
	C	3 to 5 kg/cm^2
	D	30 to 50 kg/cm^2.
8	In a HRC fuse the time between cut-off and final current zero, is known as	
	A	total operating time
	B	arcing time
	C	pre-arcing time
	D	settling time.
9	In a circuit breaker if the insulation resistance between phase terminal and earthed frame is less than the specified limit, the probable cause could be	
	A	moisture
	B	dirty insulation surface
	C	carbon or copper particles sticking to the internal surface
	D	All the answers are correct.
10	For carrying a 100 A (rms) current the cross-sectional area of aluminium bus bar should be at least	
	A	1 mm^2
	B	10 mm^2
	C	25 mm^2
	D	50 mm^2
11	Which device automatically interrupts the supply in the event of surges	
	A	Earthing switch
	B	Series reactor
	C	Isolator
	D	Circuit breaker.
12	Which bus bar scheme offers the lowest cost ?	
	A	Single bus bar scheme
	B	Ring bus bar scheme
	C	Breaker and a half scheme
	D	Main and transfer scheme.

13	Which of the following correctly represents the sequence of operations of isolator circuit breaker and earthing switch while opening a circuit	
	A	Close earthing switch
	B	Open isolator
	C	Open circuit breaker
	D	Close circuit breaker
14	In a balance 3 ϕ , 4 wire AC system, the phase sequence is RYB. If the voltage of R phase is. 230 < 0° V, then for Y phase	
	A	230 < 0 V
	B	230 < 60° V
	C	230 < 90°V
	D	230 < 120° V.
15	Voltages under Extra High Voltage are	
	A	1 kV and above
	B	11 kV and above
	C	132 kV and above
	D	330 kV and above.
16	If the height of transmission towers is increased, which of the following parameters is likely to change ?	
	A	Resistance
	B	Inductance
	C	Capacitance
	D	All answers are correct.
17	The ratio of capacitance from line to line capacitance from line to neutral is nearly	
	A	1/4
	B	½
	C	1
	D	2.
18	Transient state stability is generally improved by	
	A	using high speed governors on machines
	B	using low inertia machines
	C	dispensing with neutral grounding

	D	using high inertia machines
19	Which of the following contributes to the improvement of efficiency of Rankine cycle in a thermal power plant ?	
	A	Reheating of steam at intermediate stage
	B	Regeneration use of steam for heating boiler feed water
	C	Use of high pressures
	D	All answers are correct.
20	What is the maximum size of steam turbine usually being installed, for thermal power plants ?	
	A	120 MW
	B	250 MW
	C	500 MW
	D	1000 MW.
21	In regenerative cycle, bled steam is	
	A	discharged to atmosphere
	B	condensed in steam condenser
	C	used to beat feed water for boiler
	D	mixed with steam supplied to turbine.
22	A single phase transmission line of impedance j0.8 ohm supplies a resistive load of 500 A at 300 V. What is the sending end power?	
	A	0.8 lag
	B	0.6 lag
	C	0.4 lag
	D	Unity
23	The resistance and inductance found to be equal in a short transmission line. What will be the power factor of the load to obtain zero regulation?	
	A	Zero power factor
	B	Unity power factor
	C	0.7 lagging power factor
	D	0.7 leading power factor
24	A conductor is composed of seven identical copper strands, each having radius 'r'. The self GMD of the conductor will be	

	A	2.366r
	B	2.177r
	C	3.177r
	D	3.366r
25	The main criterion for selection of the size of a distribution for a radial distribution system is	
	A	Temperature rise
	B	Corona loss
	C	Voltage drop
	D	Capital cost
26	A synchronous generator connected to infinite bus delivers power at lagging power factor. If its excitation is increased	
	A	The terminal voltage and current increase
	B	The terminal voltage and current decrease
	C	The voltage angle and current increase
	D	The voltage angle and current decrease
27	For a fault at the terminals of a synchronous generator, the fault current is maximum for	
	A	3 phase fault
	B	3 phase to ground fault
	C	Line to ground fault
	D	Line to line fault
28	Zero sequence current can flow from a line into a transformer bank if the windings are in	
	A	Star/star
	B	Star/delta
	C	Delta/star
	D	Delta/delta
29	When a line to ground fault occurs, the current in the phase is 100 A. What is the zero sequence current?	
	A	33.3.A
	B	66.6 A
	C	0 A
	D	100 A

30	A 3-phase, 33 kV oil circuit breaker is rated 1200 A, 2000 MVA, 3s. The symmetrical breaking current is	
	A	75 kA
	B	35 kA
	C	63.75 kA
	D	45.32 kA

31. The bus admittance matrix of a three-bus three-line system is

Y=j

If each transmission line between the two buses is represented by an equivalent π network, the magnitude of the shunt susceptance of the line connecting bus 1 and 2 is

(A) 4 (B)2

(C)1 (D)0

32. A two-phase load draws the following phase currents : $i_1(t) = I_m \sin(wt - \_1)$, $i_2(t) = I_m \cos(wt - \_2)$. These currents are balanced if $\_1$ is equal to.

(A) $-\_2$ (B) $\_2$

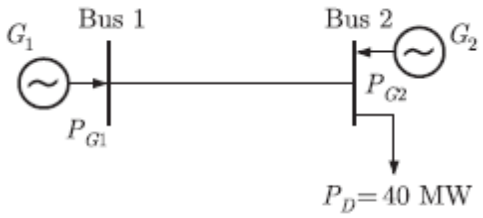
(C) $(/2 - \_2)$ (D) $(/2 + \_2)$

31. A two-phase load draws the following phase currents : $i_1(t) = I_m \sin(wt - \phi_1)$, $i_2(t) = I_m \cos(wt - \phi_2)$. These currents are balanced if ϕ_1 is equal to.

(A) $-\phi_2$ (B) ϕ_2

(C) $(\pi/2 - \phi_2)$ (D) $(\pi /2 + \phi_2)$

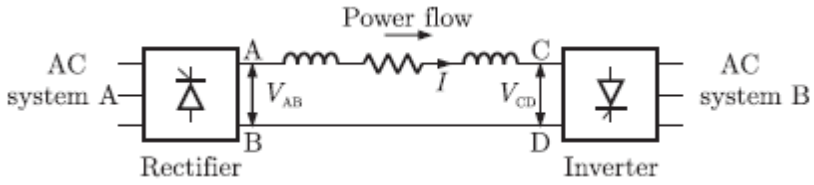
32. The figure shows a two-generator system applying a load of P_D = 40MW, connected at bus 2.



The fuel cost of generators G_1 and G_2 are :
$C_1(P_{G1})$ = 10000 Rs/MWh and $C_2(P_{G2})$ = 12500 Rs/MWh and the loss in the line is $P_{loss(pu)} = 0.5P_{G1(pu)}$,where the loss coefficient is specified in pu on a 100MVA base. The most economic power generation schedule in MW is
(A) P_{G1} = 20,P_{G2} = 22✓ (B) P_{G1} = 22,P_{G2} = 20
(C) P_{G1} = 20,P_{G2} = 20 (D) P_{G1} = 0,P_{G2} = 40

34. A negative sequence relay is commonly used to protect
(A) an alternator✓ (B) an transformer
(C) a transmission line (D) a bus bar

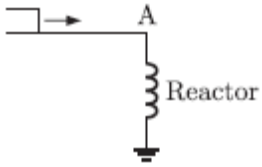
35. Power is transferred from system A to system B by an HVDC link as shown in the figure. If the voltage V_{AB} and V_{CD} are as indicated in figure, and $I > 0$, then



(A) $V_{AB}<0, V_{CD}<0, V_{AB}>V_{CD}$ (B) $V_{AB}>0, V_{CD}>0, V_{AB}<V_{CD}$

(C) $V_{AB}>0, V_{CD}>0, V_{AB}>V_{CD}$ ✓ (D) $V_{AB}>0, V_{CD}<0$

36. Consider a step voltage of magnitude 1 pu travelling along a lossless transmission line that terminates in a reactor. The voltage magnitude across the reactor at the instant travelling wave reaches the reactor is

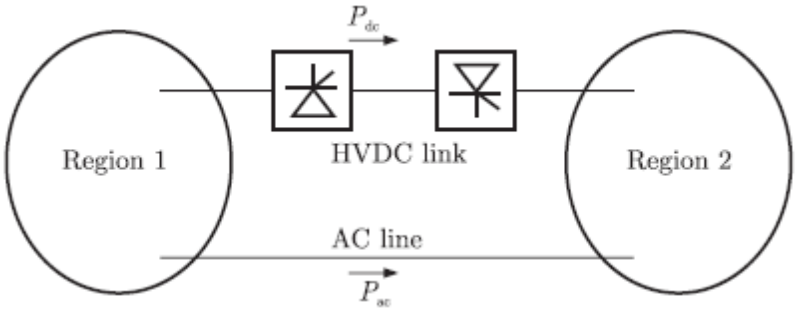


(A) -1 pu✓ (B) 1pu

(C)2pu (D) 3pu

37. A three-phase, 33 kV oil circuit breaker is rated 1200 A, 2000 MVA, 3 s. The Symmetrical breaking current is
(A) 1200 A (B) 3600 A
(C) 35 kA ✓ (D) 104.8 kA

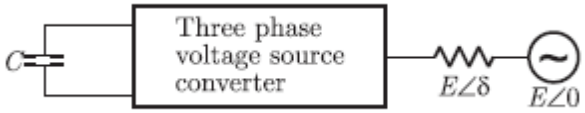
38. Two regional systems, each having several synchronous generators and loads are inter connected by an ac line and a HVDC link as shown in the figure. Which of the following statements is true in the steady state :



(A) Both regions need not have the same frequency
(B) The total power flow between the regions (P_{ac}+ P_{dc}) can be changed by controlled the HDVC converters alone
(C) The power sharing between the ac line and the HVDC link can be changed by controlling the HDVC converters alone.✓
(D) The directions of power flow in the HVDC link (P_{dc}) cannot be reversed

39. The figure below shows a three phase self-commutated voltage source converter connected to a power system. The converter's dc bus capacitor is marked as C in the figure. The circuit in initially operating in steady state with $\delta = 0$ and the

capacitor dc voltage is equal to V_{dc0}. You may neglect all losses and harmonics. What action should be taken to increase the capacitor dc voltage slowly to a new steady state value.



(A) Make δ positive and maintain it at a positive value
(B) Make δ positive and return it to its original value
(C) Make δ negative and maintain it at a negative value
(D) Make δ negative and return it to its original value✓

40. A 500 MW, 21 kV, 50 Hz, 3-phase, 2-pole synchronous generator having a rated p.f = 0.9, has a moment of inertia of 27.5×10^3 kg-m^2 .The inertia constant (H) will be
(A) 2.44 s (B) 2.71 s
(C) 4.88 s (D) 5.42 s

41. At an industrial sub-station with a 4 MW load, a capacitor of 2 MVAR is installed to maintain the load power factor at 0.97 lagging. If the capacitor goes out of service, the load power factor becomes
(A) 0.85 (B) 1.00
(C) 0.80 lag✓ (D) 0.90 lag

42. The p.u. parameter for a 500 MVA machine on its own base are: inertia, $M = 20$ p.u. ; reactance, $X = 2$ p.u.
The p.u. values of inertia and reactance on 100 MVA common base, respectively, are
(A) 4, 0.4 (B) 100, 10
(C) 4, 10 (D) 100, 0.4✓

43. An 800 kV transmission line has a maximum power transfer capacity of P. If it is operated at 400 kV with the series reactance unchanged, the new maximum power transfer capacity is approximately
(A) P (B) $2P$
(C) $P/2$ (D) $P/4$✓

44. A balanced delta connected load of $(8 + j6)\Omega$ per phase is connected to a 400 V, 50 Hz, 3-phase supply lines. If the input power factor is to be improved to 0.9 by connecting a bank of star connected capacitor the required kVAR of the of the bank is
(A) 42.7 (B) 10.2✓
(C) 28.8 (D) 38.4

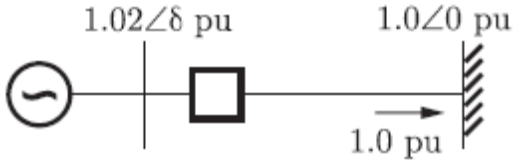
45. The A, B, C , D constants of a 220 kV line are : $A = D = 0.94\angle1^0$, $B = 130\angle73^0$, $C = 0.001\angle90^0$ If the sending end voltage of the line for a given load delivered at nominal voltage is 240 kV, the % voltage regulation of the line is
(A) 5 (B) 9
(C) 16 ✓ (D) 21

46. At a 220 kV substation of a power system, it is given that the three-phase fault level is 4000 MVA and single-line to ground fault level is 5000 MVA Neglecting

the resistance and the shunt suspectances of the system.
The positive sequence driving point reactance at the bus is
(A) 2.5 Ω (B) 4.033 Ω
(C) 5.5 Ω (D) 12.1 Ω✓

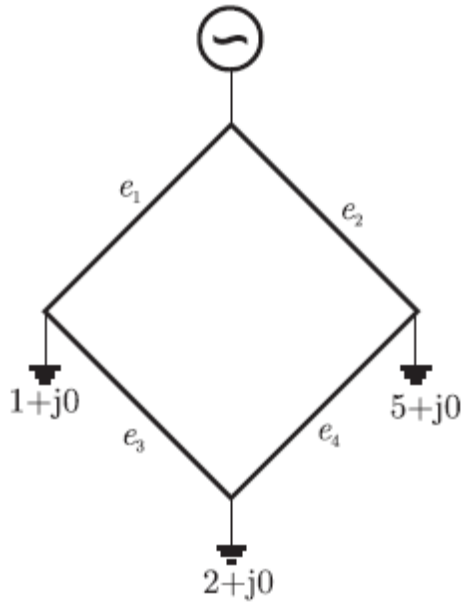
47. A loss less transmission line having Surge Impedance Loading (SIL) of 2280 MW is provided with a uniformly distributed series capacitive compensation of 30%.
Then, SIL of the compensated transmission line will be
(A) 1835 MW (B) 2280 MW✓
(C) 2725 MW (D) 3257 MW
Ans: B

48. A loss less single machine infinite bus power system is shown below



The synchronous generator transfers 1.0 per unit of power to the infinite bus. The critical clearing time of circuit breaker is 0.28 s. If another identical synchronous generator is connected in parallel to the existing generator and each generator is scheduled to supply 0.5 per unit of power, then the critical clearing time of the circuit breaker will
(A) reduce to 0.14 s
(B) reduce but will be more than 0.14 s✓
(C) remain constant at 0.28 s
(D) increase beyond 0.28 s

49. Single line diagram of a 4-bus single source distribution system is shown below. Branches e_1,e_2,e_3 and e_4 have equal impedances. The load current values indicated in the figure are in per unit.



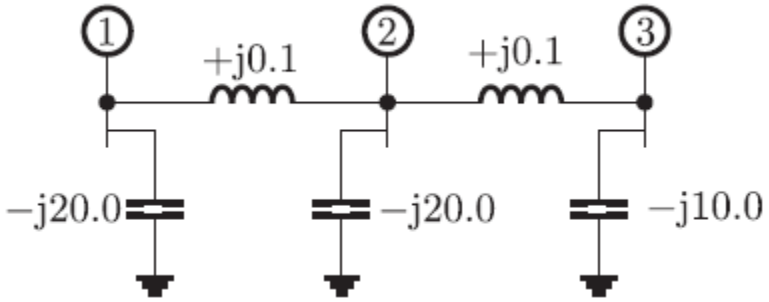
Distribution company's policy requires radial system operation with minimum loss. This can be achieved by opening of the branch
(A) e_1 (B) e_2
(C) e_3 (D) e_4✓

50. In a biased differential relay the bias is defined as a ratio of
(A) number of turns of restraining and operating coil✓
(B) operating coil current and restraining coil current
(C) fault current and operating coil current
(D) fault current and restraining coil current

51. A generator is connected through a 20 MVA, 13.8/138 kV step down transformer, to a transmission line. At the receiving end of the line a load is supplied through a step down transformer of 10 MVA, 138/69 kV rating. A 0.72 pu. load, evaluated on load side transformer ratings as base values , is supplied from the above system. For system base values of 10 MVA and 69 kV in load circuit, the value of the load (in per unit) in generator will be
(A) 36✓ (B) 1.44
(C) 0.72 (D) 0.18

52. In the thermal power plants, the pressure in the working fluid cycle is developed by
(A) condenser (B) super heater
(C) feed water pump✓ (D) turbine

53. The network shown in the given figure has impedances in p.u. as indicated. The diagonal element Y_{22} of the bus admittance matrix Y_{BUS} of the network is



(A) $-j19.8$ (B) $+j20.0$
(C) $+j0.2$ (D) $-j19.95$✓

54. Choose two appropriate auxiliary components of a HVDC transmission system from the following
P. D.C line inductor Q. A.C line inductor
R. Reactive power sources
S. Distance relays on D.C line
T. Series capacitance on A.C. line
(A) P and Q (B) P and R✓
(C) Q and S (D) S and T

55. A list of relays and the power system components protected by the relays are given in List-I and List-II respectively. Choose the correct match from the four choices given below:

List-I	List-II
P. Distance relay	**1.** Transformers
Q. Under frequency relay	**2.** Turbines
R. Differential relay	**3.** Busbars
S. Buchholz relay	**4.** Shunt capacitors
	5. Alternators
	6. Transmission lines

Codes:
P Q R S
(A) 6 5 3 1✓
(B) 4 3 2 1
(C) 5 2 1 6

(D) 6 4 5 3

56. For harnessing low variable waterheads, the suitable hydraulic turbine with high percentage of reaction and runner adjustable vanes is

(A) Kaplan✓ (B) Francis
(C) Pelton (D) Impeller

57. A power system consist of 300 buses out of which 20 buses are generator bus, 25 buses are the ones with reactive power support and 15 buses are the ones with fixed shunt capacitors. All the other buses are load buses. It is proposed to perform a load flow analysis in the system using Newton-Raphson method. The size of the Newton Raphson Jacobian matrix is

(A) 553× 553 (B) 540 ×540✓
(C) 555 ×555 (D) 554 ×554

58. Incremental fuel costs (in some appropriate unit) for a power plant consisting of three generating units are

$IC_1 = 20 + 0.3P_1$, $IC_2 = 30 + 0.4P_2$, $IC_3 = 30$

Where P_1 is the power in MW generated by unit i for i = 1,2 and 3. Assume that all the three units are operating all the time. Minimum and maximum loads on each unit are 50 MW and 300 MW respectively. If the plant is operating on economic load dispatch to supply the total power demand of 700 MW, the power generated by each unit is

(A) P_1 = 242.86MW;P_2 = 157.14MW; and P_3 = 300MW✓
(B) P_1 = 157.14MW;P_2 = 242.86MW; and P_3 = 300MW
(C) P_1 = 300MW;P_2 = 300MW; and P_3 = 100MW
(D) P_1 = 233.3MW;P_2 = 233.3MW; and P_3 = 233.4MW

59. The purpose of slack bus in the power system is to …….

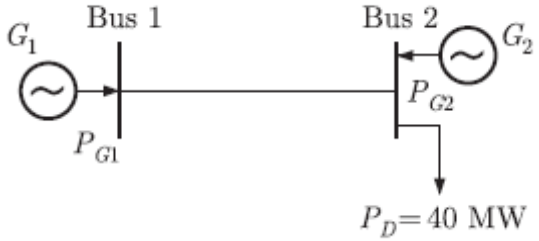
(A) Supply the losses in the system✓ (B) Act as load (C) improve the power factor (D) none of the above

60.Which method of finding load flow solution converge fast in large scale transmission system.

(A) GS Method (B) NR Method (C) FD Method✓ (D) Contingency Analysis

Questions

61. The figure shows a two-generator system applying a load of PD = 40MW, connected at bus 2.



The fuel cost of generators G1 and G2 are :

C1(PG1) = 10000 Rs/MWh and C2(PG2) = 12500 Rs/MWh and the loss in the line is where the loss coefficient is specified in pu on a 100MVA base. The most economic power generation schedule in MW is

a) PG1 = 20,PG2 = 22✓
b) PG1 = 22,PG2 = 20
c) PG1 = 20,PG2 = 20
d) PG1 = 0,PG2 = 40

62. The sequence components of the fault current are as follows:I positive = j1.5 pu,I negative =− j0.5 pu, Izero =− j1 pu. The type of fault in the system is

a) LL
b) LG
c) LLG✓
d) LLLG

63. A cylinder rotor generator delivers 0.5 pu power in the steady-state to an infinite bus through a transmission line of reactance 0.5 pu. The generator no-load voltage is 1.5 pu and the infinite bus voltage is 1 pu. The inertia constant of the generator is 5MW-s/MVA and the generator reactance is 1 pu. The critical clearing angle, in degrees, for a three-phase dead short circuit fault at the generator terminal is

a) 53.5
b) 60.2
c) 70.8
d) 79.6✓

64. For enhancing the power transmission in along EHV transmission line, the mostpreferred method is to connect a

a) Series inductive compensator in the line
b) Shunt inductive compensator at the receiving end
c) Series capacitive compensator in the line✓
d) Shunt capacitive compensator at the sending end

65. A loss less transmission line having Surge Impedance Loading (SIL) of 2280 MW is provided with a uniformly distributed series capacitive compensation of 30%.Then, SIL of the compensated transmission line will be

a) 1835 MW
b) 2280 MW✓
c) 2725 MW
d) 3257 MW

66. The concept of an electrically short, medium and long line is primarily based on the

a) nominal voltage of the line
b) physical length of the line✓
c) wavelength of the line
d) power transmitted over the line

67. High Voltage DC (HVDC) transmission is mainly used for

a) bulk power transmission over very long distances✓
b) inter-connecting two systems with same nominal frequency
c) eliminating reactive power requirement in the operation
d) minimizing harmonics at the converter stations

68. Which of the following is usually not the generating voltage?

a) 6.6 kV
b) 9.9 kV✓
c) 11kV
d) 13.2 kV.

69. Boosters are basically

a) inductors
b) capacitors
c) transformers✓
d) Synchronous motors.

70. Conductors for high voltage transmission lines are suspended from towers

a) to reduce clearance from ground
b) to increase clearance from ground✓
c) to reduce wind and snow loads

71. The fact that a conductor carries more current on the surface as compared to core, is known as
a) skin effect✓
b) corona
c) permeability
d) unsymmetrical fault.

72. The material used for fuse wire must have
a) low melting point and low specific resistance
b) low melting point and high specific resistance✓
c) high melting point and low specific resistance
d) low melting point with any specific resistance.

73. The Buchholz relay is used to protect the
a) alternators against all internal faults
b) oil immersed transformers against all internal faults✓
c) synchronous motors against all internal faults
d) transmission line against all types of faults.

74. The location of the lightning arresters is
a) near the transformer
b) away from the transformer
c) near the circuit breaker
d) away from the circuit breaker. ✓

75. Which of the following distribution systems gives the greater reliability
a) radial system
b) ring system✓

c) DC three wire system
d) open loop system.

76. In overhead transmission lines the effect of capacitance can be neglected when the length of line is less than
a) 200 km
b) 160 km
c) 100 km
d) 80 km. ✓

77. A relay used on long transmission lines is
a) mho's relay✓
b) reactance relay
c) impedance relay
d) no relay is used.

78. Litz wires are used for intermediate frequencies.to overcome
a) corona effect
b) skin effect✓
c) radio interference
d) all of the above.

79. The chances of corona are maximum during
a) summer heat
b) winter
c) dry weather
d) humid weather. ✓

80. If the height of the transmission tower is decreased, the capacitance of the line will
a) increase
b) decrease
c) remain same ✓
d) decrease exponentially.

81. the load must not be connected directly on

a) transmission line✓
b) distributor
c) service mains
d) L.T. 220 volt line.

82. In aluminium conductors steel reinforced, the insulation between aluminium and steel conductors is

a) any insulator
b) bitumen
c) insulin
d) no insulation is required. ✓

83. The main advantage of ac. transmission system over d.c. transmission system is

a) Easy transformation
b) Less losses in transmission over long distances✓
c) Less insulation problems
d) Less problem of instability.

84. Step-up substations are associated with

a) distributors
b) consumer location
c) concentrated load
d) generating stations✓

85. The safe working life of the underground cable is taken as

a) 2 years
b) 5 years
c) 40 years ✓
d) 100 years.

86. Base load plants are designed to supply power at

a) low capital cost and low operating cost

b) high capital cost and low operating cost✓
c) low capital cost and high operating cost
d) high capital cost and high operating cost.

87. Regulating transformers are used in power system to control
a) power factor
b) load flow
c) voltage ✓
d) none of these

88. The cause of transient stability is
a) alternator loosing its excitation
b) switching ON and OFF in the line
c) short circuit fault in the lines
d) all of the above. ✓

89. Load that depends on the supply frequency is of
a) fan type
b) heating and welding type
c) synchronous condenser✓
d) centrifugal pumps.

90. The turbine used for high head in hydro plant is
a) Francis turbine
b) Kaplan turbine
c) Pelton wheel ✓
d) none of these.
e)

91. Most economic load on an overhead line is
a) greater than the natural load
b) less than the natural load
c) equal to the natural load✓
d) none of the above.

92. A wave will not experience any reflection when impedance of line is equal to

a surge impedance
b load impedance✓
c surge impedance
d All answers are correct

93. At present how many HVDC lines are there in india?

a none
b one
c two
d more than two✓

94. On no load in EHV lines what is the relation between receiving and sending end voltage?

a receiving end voltage > sending end voltage✓
b receiving end voltage < sending end voltage
c receiving end voltage = sending end voltage
d none

95. What is the surge impedance loading of 400kv line with surge impedance given as 160 ohms

a 1000 MW✓
b 1000 KW
c 256 MW
d 256 KW

96. Q.Where is the hydro power plant located in following places?

a Raamagundam
b Tarapur

c Kalpakam
d Srisailam✓

97. Self GMD is used in the calculation of_____

a inductance only✓
b inductance and capacitance
c capacitance only
d none

98. What is the GMD if the distance between the lines are 6m,6m,12m?

a 7.55m✓
b 6m
c 12m
d 8.56m

Zero sequence current doesn't exist in the following fault

a L-G
b L-L✓
c L-L-G
d L-L-L-G

99. To avoid arcing connect suitable value of _____ in earthing.

a capacitance
b indunctance✓
c resistance
d susceptance

100. In the following type of conductors the corona is minimum

a circular✓
b stranded
c helical
d rectangular

101. At what frequency corona loss is more?

a 50Hz
b 60Hz
c 25Hz
d 100Hz✓

102. What is the line current of a circuit when the current transformer of 1000:5 rating measures 4Amperes?

a 5000 A
b 1000 A
c 400 A
d 800A✓

103. If the time delay of relay with TMS setting 0.1 is 10 sec, then what is the time delaty when the TMS setting is changed to 0.5

a 2 sec
b 20 sec
c 100 sec
d 5 sec✓

104. In distribution lines_____

a X/R<0.1
b X/R>10
c X/R<1✓
d X/R<0.01

105. In EHV lines _____

a X/R=10
b X/R=100
c X/R>3✓
d X/R<3

106. The machine used in windmills is_____

a Alternator
b Induction generator✓
c Synchronous generator
d All

107. Insulators in EHV lines are designed based on_____

a switching voltages✓
b peak voltages
c corona
d lightning voltages

108. The value of restriking voltage depends on_____

a inductance of line
b capacitance of line
c both✓
d none

109. HRC fuse and circuit-breaker combination is used CB operates for

a low over-load currents✓
b high over-load currents

c combination is never used

110. Reflection coefficent of current of an open ended line.

a 1
b -1✓
c 2
d -2

111. Positive sequence terminal voltage is zero in

a L-L
b L-L-G
c L-G
d L-L-L✓

112. Most economical load in underground cable is

a less than surge impedance✓
b equal to surge impdance
c more than surge impedence
d any load

113. Maximum power transfer through line V1= 110 kv, V2= 100kv, X=22 ohm is

a 500 MW✓
b 500 KW
c 250 MW
d 250 KW

114. Base load of a power station stands for

a 2-4 hours/day
b 4-8 hours/day
c 8-12 hours/day
d 12-24hours/day✓

116..A wire is placed on the top of a transmission line to protect from

a surge high voltage
b Direct lightning strokes✓
c indirect lightning strokes
d Switching over voltages

117. Feeder is designed mainly from the point of view of

A. Its current carrying capacity✓
B. Voltage drop in it
C. Operating voltage
D. Operating Frequency

118. Distributors are designed from the point of view of
A. Its current carrying capacity
B. Operating voltage
C. Voltage drop in it ✓
D. Operating frequency

119. The main drawback of overhead system over underground system is-

A. Underground system is more flexible than overhead system
B. Higher charging current

C. Surge problem
D. High initial cost

120. By increasing the transmission voltage to double of its original value the same power can be dispatched keeping the line loss-

A. Equal to original value
B. Half the original value
C. Double the original value
D. One fourth of original value

121. For the same voltage drop, increasing the voltage of a distributor n time-

A. Reduces the cross section of the conductor by n times
B. Increases the cross section of the conductor by n times
C. Reduces the cross section of conductor by n^2 times
D. Increases the cross section of the conductor by n^2 times

122. Improving power factor
A. Reduces current for a given output
B. Increases losses in line ✓
C. Increases the cost of station equipment
D. None

123. Corona is

A. Partial breakdown of air
B. Complete breakdown of air✓
C. Sparking between lines
D. None of these

124. Bundled conductors reduce
A. Surface electric stress of conductor
B. Increases the line reactance
C. Decrease the line capacitance
D. All

GATE QUESTIONS

125. For a fixed value of complex power flow in a transmission line having a sending end voltage V, the real power loss will be proportional to [GATE 2009]

(a) V
(b) V^2
(c) $1/V^2$
(d) 1/V

126. How many 200W/220V incandescent lamps connected in series would consume the same total power as a single 100W/220V incandescent lamps? [GATE 2009]

(a) Not possible
(b) 4
(c) 3
(d) 2

127. Consider two buses connected by an impedance of (0+j5)Ω. The bus 1 voltage is 100∠30° V, and bus 2 voltage is 100∠0° V. The real and reactive power supplied by bus 1, respectively are

A. 1000W, 268Var
B. -1000W,-134Var
C. 276.9W,-56.7Var
D. -276.9W,56.7Var

128. For enhancing the power transmission in a long EHV transmission line, the most preferred method is to connect a

A. Series inductive compensator in the line
B. Shunt inductive compensator at the receiving end
C. Series capacitive compensator in the line
D. Shunt capacitive compensator at the sending end

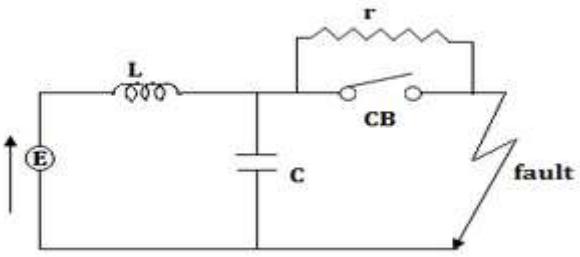
Power Systems

S.No	Question
129	Boosters are basically (A) inductors (B) capacitors (C) transformers✓ (D) synchronous motors.
130	Conductors for high voltage transmission lines are suspended from towers (A) to reduce clearance from ground (B) to increase clearance from ground✓ (C) to reduce wind and snow loads (D) to take care of extension in length during summer.
131	Transmission efficiency increases as (A) voltage and power factor both increase✓ (B) voltage and power factor both decrease (C) voltage increases but power factor decreases (D) voltage decreases but power factor increases.
132	When alternating current passes through a conductor (A) it remains uniformly distributed throughout the section of conductor (B) portion of conductor near the surface carries more current as compared to the core✓ (C) portion of conductor near the surface carries less current as compared to the core (D) entire current passes through the core of the conductor.
133	The fact that a conductor carries more current on the surface as compared to core, is known as (A) skin effect✓

	(B) corona (C) permeability (D) unsymmetrical fault.
134	The effective resistance of a conductor will be the same as ohmic resistance when (A) current is in true sine wave form (B) voltage is low (C) power factor is unity (D) Current is uniformly distributed in the conductor cross-section.✓
135	The skin effect of a conductor will reduce as the (A) diameter increases (B) frequency increases (C) permeability of conductor material increases (D) resistivity of conductor material increases.✓
136	Feeder is designed mainly from the point of view of- A. Its current carrying capacity ✓ B. Voltage drop in it C. Operating voltage D. Operating Frequency
137	Improving power factor- A. Reduces current for a given output B. Increases losses in line C. Increases the cost of station equipment✓ D. None
138	The disadvantage of constant voltage transmission is (A) short circuit current of the system is increased✓ (B) load power factor in heavy loads (C) large conductor area is required for same power transmission

	(D) air of the above.
139	The effect of corona is (A) increased energy loss✓ (B) increased reactance (C) increased inductance (D) all of the above.
140	Presence of ozone as a result of corona is harmful because (A) it gives bad odor (B) it corrodes the material✓ (C) it transfers energy to the ground (D) reduces power factor.
141	Between two supports, due to sag the conductor takes the form of (A) catenary✓ (B) triangle (C) ellipse (D) semi-circle.
142	The effect of wind pressure is more predominant on (A) transmission lines (B) neutral wires (C) insulator (D) supporting towers.✓
143	When transformers or switchgears are to be installed in a transmission line, the poles used are (A) I type

	(B) J type (C) H type✓ (D) L type.
144	ACSR conductor implies (A) All conductors surface treated and realigned (B) Aluminum conductor steel reinforced✓ (C) Anode current sinusoidally run (D) Anodized Core Smooth Run.
145	During storm the live conductor of public electric supply breaks down and touches the earth. The consequences will be (A) supply voltage will drop (B) supply voltage will increase (C) current will flow to earth✓ (D) no current will flow in the conductor.
146	For transmission lines the standing wave ratio is the ratio of (A) maximum voltage to minimum voltage✓ (B) maximum current to minimum voltage (C) peak voltage to rms voltage (D) maximum reactance to minimum reactance.
147	The bundling of conductors is done primarily to (A) reduce reactance✓ (B) increase reactance (C) increase ratio interference (D) reduce radio interference.
148	Shunt capacitance is usually neglected in the analysis of

	(A) Short transmission lines✓ (B) Medium transmission lines (C) Long transmission lines (D) Medium as well as long transmission lines.
149	In the following figure, which component ensures the safety of the line from damage?  a. Relay✓ b. Circuit breaker c. Bus bar d. Current transformer
150	What is the purpose of back up protection? a. To increase the speed b. To increase the reach c. To leave no blind spot d. To guard against failure of primary✓
151	The isolators used in the transmission lines are capable of breaking a. Fault current b. supply current c. Charging current✓ d. Load current
152	What is the making to breaking current ratio for an extra high voltage circuit breaker? a. More than 1✓ b. Equal to 1 c. Less than 1 d. A negative value
153	Which of the following circuit breaker is highly reliable and has a least maintenance? a. Oil circuit breakers b. Air blast c. Vacuum circuit breakers d. SF_6 circuit breakers✓

154	What does protective relay provide? a. Provide additional safety to the circuit breaker in its operation. b. Close the contacts when the actuating quantity attains a certain predetermined value.✓ c. Limit the arcing current during the circuit breaker operation. d. Earth or ground any stray voltage.
155	Keeping in view the cost and the overall effectiveness, which of the following circuit breaker is best suited for capacitor bank switching? a. Vacuum circuit breaker✓ b. Air blast CB c. SF_6 d. Oil CB
156	SF_6 gas is imported in _____. a. Air cylinders b. Gas cylinders c. Liquid form in cylinders✓ d. Solid form.
157	What is the normal pressure at which the SF_6 gas is maintained in the closed position of the breaker? a. 2 kg / cm^2 b. 2.5 kg /cm^2 c. 2.8 kg / cm^2 ✓ d. 3 kg / cm^2
158	What is the breaking capacity of the air blast circuit breaker? a. 5000 MVA b. 6000 MVA c. 7000 MVA✓ d. 10000 MVA

SCHOOL OF ELECTRICAL ENGINEERING

ELECTRICAL AND ELECTRONICS MEASUREMENTS

Comprehensive Viva

1. A pressure gauge is calibrated from 0-50 kN/m^2. It has a uniform scale with 100 scale divisions. 1/5^{th} of a scale division can be read with certainty. The resolution of the gauge is:
   a) 0.4 kN/m^2 b) 0.1 kN/m^2 ✓

   c) 0.2 kN/m^2 d) 0.3 kN/m^2

2. A 0-300 V voltmeter has an error of ± 2% of full scale deflection. What would be the range of readings if true voltage is 30 V?
   a) 24V – 36 V✓ b) 20V to 40 V

   c) 29.4V – 30.6 V d) 24.4 V – 36.6 V

3. The precision index (h) should be;
   a) less for high precision

   b) high for high precision✓

   c) probability of deviation x is less, when h is less

   d) smaller value of h deviations are closely clustered together.

4. Modifying input is_____,
   a) quantities to which the instrument is unintentionally sensitive

   b) quantities that the instrument is specifically intended to measure

   c) quantities which changes the input-output relation✓

   d) quantities to which the instrument is intentionally sensitive

5. Sensitivity of a wheat-stone bridge is given by 0.429 mm/Ω. Find the require change of resistance in the unknown arm to produce a change in deflection of 3 mm of the galvanometer.
   a) 7Ω ✓ b) 0.143Ω

   c) 0.007Ω d) 14.3Ω

6. Noise produced in semiconductors due to random movement of charges is called,
   a) generating noise
   b) johnson's noise✓
   c) conducting noise
   d) shot noise

7. A moving iron instrument can be used for current and voltage measurements:
   a) in ac circuits only
   b) in dc circuits only✓
   c) in both ac and dc circuits
   d) in magnetic circuits

8. The power in a dc circuit is measured using ammeter and a voltmeter. The voltmeter is connected on the load side. The power indicated is;
   a) the power consumed in the load
   b) the sum of power consumed by load and the voltmeter✓
   c) the sum of power consumed by load and the ammeter
   d) power consumed by the voltmeter

9. The output waveform of a sweep generator used in the cathode ray oscilloscope is:
   a. Square Wave b. Sinusoidal wave c. Pulse d. Sawtooth✓

10. The flip-flop used in synchronous counter is;
    a) SR b) T c) D d) JK✓

11. In the single phase induction meter, in order to obtain true value of energy, the shunt magnetic flux should lag behind the applied voltage by;
    a) 90º ✓
    b) 0º
    c) 120º
    d) 45º

12. The controlling torque in single phase power factor meter is provided by;
    a) spring control
    b) gravity control
    c) stiffness of suspension
    d) no controlling torque ✓

13. Torque in the induction type energy meter due to current coil is produced by;

a) interaction of eddycurrent due to current coil and flux due to pressure coil✓
b) interaction of eddycurrent due to pressure coil and flux due to pressure coil
c) interaction of eddycurrent due to current coil and flux due to current coil
d) interaction of eddycurrent due to pressure coil and flux due to current coil

14. In an electrodynamometer type of wattmeter,
a) the current coil is made fixed✓ b) the pressure coil is made fixed
c) any of the two coils can be made fixed d) both the coils should be movable

15. The power in a 3 phase four wire circuit can be measured by using;
a) 2 wattmeter b) 4 wattmeter
c) 3 wattmeter✓ d) 1 wattmeter

16. A 1mA d'Arsonval movement has a resistance of 100Ω. It is to be converted to a 10V voltmeter. The value of multiplier resistance is:
a) 999Ω b) 9999Ω
c) 990Ω d) 9900Ω ✓

17. In a two wattmeter method, the wattmeters are connected in the line 1 and 2. The laod is star connected load. What is the angle between the line voltage V_1 and line current I_2?
a) 120º b) 90º
c) 120+Φ d) 90+Φ ✓

18. Brook's deflection potentiometer is used when the unknown voltage:
a. Constant b. linear
c. Varying d. All the answers are correct✓

19. The phase displacement of the rotor EMF in drysdale potentiometer being equal to;
a. angle of rotor from zero position✓

b. angle of rotor

c. angle of the slide wire

d. angle of rotor with reference to stator coil

20. A potentiometer is basically a _____.
    a. deflecting type instrument
    b. null type instrument✓
    c. deflecting as well as null type instrument
    d. a digital instrument

21. Maxwell's induction-capacitance bridge is used for measurement of inductance of:
    a. Low Q coils✓
    b. medium Q coils
    c. high Q coils
    d. low and medium Q coils

22. Frequency can be measured using;
    a. Maxwell's bridge
    b. schering's bridge
    c. Campbell bridge
    d. Wien's bridge✓

23. An AC bridge with Z_1 =200 30° , Z_2 =150 0° , Z_3 =250 -40° , in order to balance the bridge the Z_4 should be:
    a. 187.5 ∠70 ✓
    b. 187.5 ∠10
    c. 187.5 70
    d. 187.5 10

24. The advantages of Hay's bridge over maxwell's inductance –capacitance bridge is because;
    a. Its equation for balance do not contain any frequency term
    b. It can be used for measurement of inductance of high Q coils✓
    c. It can be used for measurement of inductance of low Q coils
    d. All answers are wrong

25. Wagner's devices are used in A.C. bridge circuit for_____.
    a. Eliminating the effects of earth capacitance✓
    b. Eliminating the effects of inter component capacitance
    c. Eliminating the effects of stray capacitance
    d. Shielding the bridge elements

26. In amplified DC voltmeter the FET will be used in the _____.

a. Attenuator stage b. Input stage✓

c. output stage d. meter stage

27. In a multimeter, internal battery is required to measure;
a. Voltage b. Resistance✓

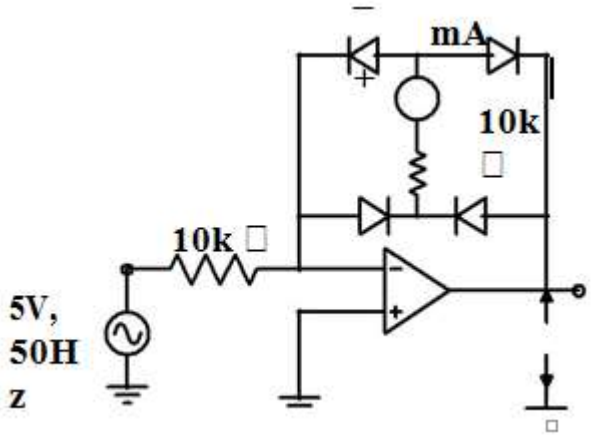
c. current d. frequency

28. A triangle wave shape is obtained:
a) By integrating a square wave✓
b) By differentiating a sine wave
c) By integrating a sine wave
d) By differentiating a square wave

29. In which moving iron instrument two vanes will be there?
a) attraction type b) repulsion type✓
c) vibration type d) acceleration type

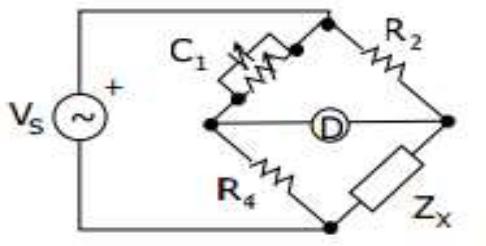
30. The execution time and throughput are;
a) Directly proportional b) derivatives with respect to time
c) inversely proportional✓ d) independent parameters

31 The circuit below incorporates a permanent magnet moving coil milli-ammeter of range 1 *mA* having a series resistance of 10 *k*_. Assuming constant diode forward resistance of 50 , a forward diode drop of 0.7 *V* and infinite reverse diode resistance for each diode, the reading of the meter in *mA* is



(A) 0.45✓ (B) 0.5 (C) 0.7 (D) 0.9

32 The bridge circuit shown in the figure below is used for the measurement of an unknown element ZX. The bridge circuit is best suited when ZX is a



a) low resistance (b) high resistance (c) low Q inductor✓ (d) lossy capacitor

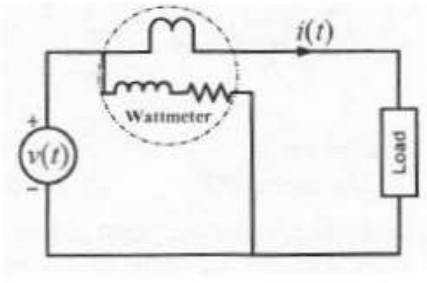
33. For the circuit shown in the figure, the voltage and current expressions are $v(t) = E_1 \sin(wt) + E_3 \sin(3wt)$ and $i(t) = I_1 \sin(wt-\phi_1) + I_3 \sin(3wt-\phi_3) + I_5 \sin(5wt)$. The average power measured by the wattmeter is. **ANSWER----------→(C)**

(A) $\frac{1}{2}E_1I_1\cos\phi_1$

(B) $\frac{1}{2}\left[E_1I_1\cos\phi_1 + E_1I_3\cos\phi_3 + E_1I_5\right]$

(C) $\frac{1}{2}\left[E_1I_1\cos\phi_1 + E_3I_3\cos\phi_3\right]$

(D) $\frac{1}{2}\left[E_1I_1\cos\phi_1 + E_3I_1\cos\phi_1\right]$



34 . A 2A full-scale PMMC type dc ammeter has a voltage drop of 100 mV at 2A. The meter can be converted into a 10A full-scale dc ammeter by connecting a

(A) 12.5 m resistor in parallel with the meter
(B) 12.5 m resistor in series with the meter ✓
(C) 50.0 m resistor in parallel with the meter
(D) 50.0 m resistor in series with the meter

35. The dielectric loss of a capacitor can be measured by which one of the following ?

(A) Wien bridge (B) Owen bridge (C) Schering bridge✓ (D) Maxwell bridge

36. Which bridge is used to determine frequency?

(A) Anderson bridge (B) De Sauty bridge (C) Wien bridge✓ (D) Campbell bridge

37. For low resistance (from few micro ohms to one ohm measurement which bridge is used ?

(A) Wheatstone bridge (B) Kelvin bridge✓ (C) Guarded Wheatstone bridge (D) Maxwell bridge

38. Schering bridge can be used to measure which one of the following ?

(A) Q of a coil (B) Inductance and its Q-value (C) Very small resistance

(D) Capacitance and its power factor✓

39. Inductance is measured by which one of the following ?

(A) Wien bridge (B) Schering bridge (C) Maxwell bridge✓ (D) Owen bridge

40. An average-reading digital multimeter reads 10V when fed with a triangular wave, symmetric about the time-axis. For the same input an rms-reading meter will read

A. 20/√3✓

B. 10/√3

C. 20√3

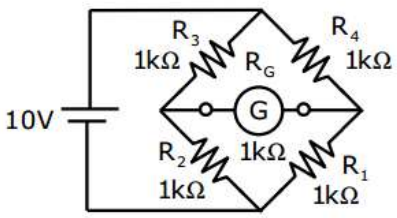
D. 10√3

41. An analog voltmeter uses external multiplier settings. With a multiplier setting of 20kΩ, it reads 440V and-with a multiplier setting of 80kΩ it reads 352V. For a multiplier setting of 40kΩ,voltmeter reads

A. 371V✓ B. 383V C. 394V D. 406 V

42. In the Wheatstone bridge shown below, when the resistance R1 increases by

1ohm, the current through the galvanometer is



(Consider the Thevenin's equivalent resistance of the bridge in the calculations)

(A) 1.25 μA (B) 2.5 μA (C) 12.5 μA (D) 25 μA

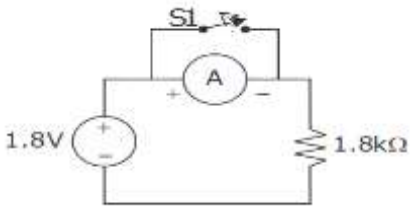
43. A PMMC type ammeter has full scale current of 100μA and a coil resistance of 100Ω. The resistance required to convert the 100μA ammeter into 1A full scale dc ammeter is

(A) 10mΩ in series with the meter (B) 10mΩ in parallel with the meter ✓

(C) 1mΩ in series with the meter (D) 1mΩ in parallel with the meter

44. The PMMC ammeter A in the adjoining figure has a range of 0 to 3mA. When

switch S1 is opened, the pointer of the ammeter swings to the 1mA mark, returns and settles at 0.9mA. The meter is



(A) critically damped and has a coil resistance of 100Ω

(B) critically damped and has a coil resistance of 200Ω

(C) under damped and has a coil resistance of 100Ω

(D) under damped and has a coil resistance of 200Ω

45. Meggar is a method of

a) High resistance measurement✓ b) low resistance measurement c) medium d) none

46…A Wheatstone bridge cannot be used for precision measurements because errors are introduced in to on account of

a) Resistance of connecting leads b) thermo-electric EMF c) contact resistance d) all the above ✓

47. For low resistance (from few micro ohms to one ohm) measurement, which bridge is used?
a) Wheatstone bridge (B) Kelvin bridge✓ (C) Guarded Wheatstone bridge (D) Maxwell bridge

48. In a permanent magnet Moving coil ammeter the deflection of the pointer is proportional to product of flux density of magnetic field produced by the permanent magnet and the current in the moving coil. If the strength of the permanent magnet becomes 95% of the original, the meter gives erroneous reading resulting in to error. This error can be classified as:

a) Gross error b) Systematic error c) Random error✓ d) none of the above

49. A PMMC can be used as ---------- by using a low resistance shunt
    a) Ammeter✓ b) Voltmeter c) fluxmeter d) Ballistic galvanometer
50. A potentiometer may be used for measurement of
    a) Resistance b) current c) Calibration of voltmeter and ammeter d) all the above✓
51. In majority of instruments damping is provided by

    a) Fluid friction b) Spring c) eddy currents✓ d) all the above

52. To measure a resistance with the help of potentiometer it is
    a) Necessary to standardize the potentiometer
    b) Not necessary to standardize the potentiometer✓
    c) Necessary to use volt-ratio box
    d) None
53. A phase shifting transformer is used in conjunction with
    a) Drysdale potentiometer✓ c) AC Coordinate Potentiometer
    b) AC Polar type d) None
54. For high measurement capacitance measurement ----------bridge is used
    a) Weins bridge b) Schering bridge✓ c) Se santy bridge d) none

55. A PMMC type ammeter has full scale current of 100μA and a coil resistance of 100Ω. The resistance required to convert the 100μA ammeter into 1A full scale dc ammeter is
    (A) 10mΩ in series with the meter (B) 10mΩ in parallel with the meter✓
    (C) 1mΩ in series with the meter (D) 1mΩ in parallel with the meter

56. Electronic voltmeters which use rectifiers employ negative feedback. This is done
    (A) to increase the overall gain (B) to improve the stability

    C) to overcome the non-linearity of diodes✓ (D) to increase the bandwidth

57. Systematic error of an instrument for measurement can be minimized by
    (A) selecting a proper measuring device for the particular application
    (B) calibrating the measuring device against a standard device
    (C) applying correction factors for change of ambient conditions
    (D) carrying out all of the above✓
58. Modern electronic multimeters measure resistance by
    (A) taking advantage of an electronic bridge compensator for nulling✓
    (B) forcing a constant current and measuring the voltage across unknown resistance
    (C) using a bridge circuit
    (D) applying a constant voltage across the unknown resistance and measuring the current
    (E) through it.
59. The range of Kelvin's double bridge is

a) 0.1 μΩ to 1 Ω✓ b) 0.01 μΩ to 0.1 Ω c) 0.1 μΩ to 1 MΩ d) greater than 1 MΩ

60. Gearing in the Bourdon tube acts as
    a) Manipulation element✓ b) Conversion element c) Presentation element d) Sensing element

61. Which of the following system has zero dynamic error?

    a)Zero order✓
    b)First order
    c)Second order
    d)None

62. ----------describes the ability of the repeatability of an instrument.

    a)Accuracy
    b)Precession✓
    c)Dead zone
    d)Hysteresis

63. A voltmeter reading is being taken without correcting its zero position of the pointer. This type of errors is called…….

    a)Systemic error✓
    b)Random error
    c)Environmental error
    d)Gross error

64. Probable error of one reading in terms of standard deviation is ……

    a)6.745σ
    b) 67.45σ
    c) 0.6745σ✓
    d)1.6745 σ

65. For under damped second order system

    a) $0 < \varepsilon < 1$✓
    b)ε=1
    c) ε 1
    d) ε=0

66. A circuit was tuned for resonance by 8 students and the values of resonant frequency in kHz were recorded as 532,548,543,535,546,531,543 and 536. The average deviation of the readings is…….

a) 5.5 kHz
b) 5.75 kHz
c) 5.25 kHz
d) 5.15 kHz

67. PMMC meters are directly suitable for……

a) DC measurements✓
b)AC measurements
c)Both a and b
d) None

68. Given a frame of permanent moving coil is 6m2, the number of winding around coil is 50 and flux 0.12 Wb/ m2. If 1mA current flows through the coil, calculate the deflection torque.

a)3.6m N-m
b)36 m N-m✓
c)0.36m N-m
d)3.36 m N-m

69. Which of the following is the dynamic characteristic of an instrument?

a)Reproducibility
b)Sensitivity
c)Dead zone
d)Fidelity✓

70. Which of the following is an example of an integrating instrument?

a)Ammeter
b)Voltmeter
c)Watt meter
d)Energy meter✓

71. Which of the following essential features is possessed by an indicating instrument?

(a)Deflecting device
(b)Controlling device
(c)Damping device
(d)All of the above✓

72. A moving coil permanent magnet instrument can be used as _____ by using a low resistance shunt.

(a)ammeter✓
(b)voltmeter
(c)flux meter
(d)ballistic galvanometer

73. The disc of an instrument using eddy current damping should be of……

(a)Conducting and magnetic material
(b)Non conducting and magnetic material
(c)Conducting and nonmagnetic material✓
(d)None of the given answers

74. For measuring current at high frequency we should use……

(a)Moving iron instrument
(b)Electrostatic instrument
(c)Thermocouple instrument✓
(d)None of the given answers

75. The resistance in the circuit of the moving coil of a dynamometer wattmeter should be……

(a)Almost zero
(b)Low
(c)High✓
(d)None of the above

76. In a 3 phase power measurement by two wattmeter method the reading of one of the wattmeter was zero. The power factor of the load must be…….

(a)Unity
(b)0.5✓
(c)0.3
(d)zero

77. Which one of the following can act as the inverse transducer?

a)Resistance potentiometer
b)LVDT
c)Capacitive transducer
d)Piezoelectric transducer. ✓

78. In metal wire strain gauge, the change in resistance on application of strain is mainly due to…….

a) Change in length of the wire
b) Change in diameter of the wire
c) Change in both length and diameter of the wire✓
d) Change in resistivity.

79. The order in which the temperature transducers exhibit non-linearity (decreasing manner) is ……..

a)Thermocouple, RTD, Thermistor
b)Thermistor, Thermocouple, RTD✓
c)RTD, Thermocouple, Thermistor
d)Thermistor, RTD, Thermocouple

80. A thermistor has a resistance of 3980 Ω at ice point and 794 Ω at 50 oC . The resistance temperature relation is given by $R_T = aR_O e^{\frac{b}{T}}$. Calculate a and b.

a)$a = 30 \times 10^{-6}, b = 2845$

b) $a = 3.0 \times 10^{-6}, b = 2845$✓

c) $a = 30 \times 10^{-6}, b = 284.5$

d) $a = 30 \times 10^{-6}, b = 2.845$

81. A strain gauge has a gauge factor of 4. It is attached to a metal bar that stretches from 0.25m to 0.255m when strained. What is percentage change in resistance?

a)8% ✓
b)0.8%
c)8.8%
d)2%

82. Two plates of parallel plate capacitive transducer are 30 mm apart and the space is filled with two different dielectric materials. One material is 1cm thick with a dielectric constant of 5 and the other material is 20 mm thick with a dielectric constant 10. If the capacitive transducer were to made up of a single dielectric material, what is the dielectric constant of that material?

a)5.5
b)6.5
c)7.5
d)8.5✓ (8.33)

83. Radio frequency (RF) is any of the Electromagnetic wave frequencies that lie in the range extending from around…….

Ans: 3khz to 300Ghz
a)3 kHz to 300kHz
b) 3 kHz to 30kHz
c) 30 kHz to 300kHz
d) 3 kHz to 3000kHz

84. The main difference between signal generator and oscillator is……

a) Oscillator can modulate the generated waveform which cannot be done by signal generator.
✓b) Oscillator cannot modulate the generated waveform which can be done by signal generator.
c) Both are same
d) Oscillator can be used only for particular frequency generations.

85. Cross talk is …….

✓a. The disturbance caused in the nearby channel or circuit due to transmitted signal
b. Adjacent frequency rejection
c. Generation of closely lying side bands
d. None of the above

86. The standard value for Intermediate frequency (IF) in AM receivers is

✓a. 455 KHz
b. 580 KHz
c. 10.7 MHz
d. 50 MHz

87. Lissajous pattern in CRO is used for

a)✓ Phase measurement
b) Frequency measurement
c) Amplitude measurement
d) None

88. Most widely used RTD element is

a)Copper
b)Nickel
c)✓Platinum
d)Iron

89. Instrument transformers are used for

a)Very low DC measurements
b) Very low AC measurements
c) ✓Very high AC measurements
d) None

90. LVDT consists of..

a) 1 primary and 1 secondary
b)✓ 1 primary and 2 secondary
c) 2 primary and 1 secondary
d) 2 primary and 2 secondary

91. The systematic errors of an instrument can be reduced by making

a).✓ The sensitivity of instrument to environmental input as low as possible
b) The sensitivity of instrument to environmental input as high as possible
c) Systematic errors does not depend on the sensitivity of instrument
d) None of these

92. Calibration of instrument is an important consideration in measurement system. The errors due to instruments being out of calibration can be rectified by

a. ✓Increasing the frequency of recalibration
b. Increasing the temperature coefficient
c. Increasing the susceptibility of measuring instrument
d. Decreasing the frequency of recalibration

93. Damping torque is the torque which acts on

a. Stationary system of the instrument
b.✓ Moving system of the instrument only when it is stationary
c. Moving system of the instrument only when it is moving
d. Stationary system of the instrument only when the moving system is moving

94. The gravity controlled instruments has to be kept

a.✓ Vertical
b. Horizontal
c. Inclined at 45 degree
d. Inclined at 75 degree

95. In induction voltmeter, split phase windings are obtained by connecting a

a. High resistances in series with windings of both the magnets
b.✓ High resistance in series with the winding of one magnet and an inductive coil in series with the windings of other magnet
c. An inductive coil in series with the winding of one magnet and a capacitance in series with the windings of other magnet
d. Inductive coils in series with the winding of both the magnets

96. The frequency errors in induction instruments can be compensated by the use of

a. Non inductive shunt in both ammeters and voltmeters
b.✓ Non inductive shunt in case of ammeters and are generally self compensated in case of voltmeters
c. Self compensated in case of both ammeters and voltmeters
d. Self compensated in case of ammeters and non inductive shunt in case of voltmeters

97. In a moving coil of a meter swamping resistance is added to

a. Reduce the frequency error
b.✓ Reduce the temperature error
c. Reduce the power consumption
d. All of these

98. For the measurement of low resistances, Kelvin's double bridge has high accuracy because

a.✓ It has two set of ratio arms which eliminates effect of resistance of connecting lead
b. It has a null indicating galvanometer
c. It has two null indicator
d. It has four sets of ratio arms which eliminates the effect of resistance of connecting lead

99. The Wien's bridges is suitable for the measurement of frequency of the range of

a. Less than 100 Hz
b.✓ 100 Hz to 100 kHz
c. 1 kHz to 100 MHz
d. More than 100 MHz

100. For the measurement of unknown inductance in terms of known capacitance, the suitable ac bridges are

a. Maxwell and Schering bridge
b. Maxwell and Wien's bridge
c.✓ Maxwell and Hay's bridge
d. Hay's and Wien's bridge

101. If a capacitor is connected across a portion of resistance of multiplier of the wattmeter then the pressure coil of the circuit becomes

a. Inductive
b.✓ Non inductive
c. Capacitive
d. Non capacitive

102. Ballistic galvanometer are principally used for the measurement of

a. Current
b. Voltage
c. Power
d.✓ Electric charges

103. The potential transformers are used to measure large voltage using

a. High range voltmeter
b.✓ Low range voltmeter
c. High range ammeter
d. Low range ammeter

104. If the displacement is measured with strain gauge then the number of strain gauge normally required are

a. One
b. Two
c. Three
d.✓ Four

105. LVDT which is an instrument for the measurement of displacement, works on the principal of

a. Linear inductance
b. Non - linear inductance
c. ✓Mutual inductance
d. Linear capacitance

106. In rotary variable differential transformer, the mutual inductance between the primary and secondary coils varies

a. Linearly with the angular displacement✓
b. Non - linearly with the angular displacement
c. Linearly with the linear displacement
d. Non - linearly with the linear displacement

107. In a ballistic galvanometer, the deflecting torque is proportional to

(a) the current through coil✓
(b) square of current through coil
(c) square-root of current through coil
(d) sine of measured

108. The error of an instrument is normally given as a percentage of

(a) measured value
(b) full-scale value✓
(c) mean value
(d) rms value

109. If the instrument is to have a wide range, the instrument should have

(a) Linear scale
(b) Square-law scale
(c) Exponential scale

(d) Logarithmic scale✓

110. If the instrument is to have a wide range, the instrument should have

(a) Linear scale
(b) Square-law scale
(c) Exponential scale
(d) Logarithmic scale✓

111. Why is a MISC meter not recommended for DC measurement?

(a) The meter is calibrated for AC and it's error for DC would be high
(b) The meter does not respond to DC signals
(c) The error is high due to hysteresis effect✓
(d) The error is high due to eddy current effect

112. No eddy current and hysteresis losses occur in

(a) Electrostatic instruments✓
(b) PMMC instruments
(c) Moving iron instruments
(d) Electrodynamo meter instruments

113. In moving coil meters, damping is provided by

A) damping vane in the air tight chamber.
B) the aluminium frame of the coil.
C) eddy current disk.✓
D) The coil spring attached to the moving mechanism.

114. In which of the transformer is the secondary nearly short circuited under normal operating conditions?

A. CT✓
B. PT
C. Distribution transformer
D. Power transformer

115. In a strain measuring device using a strain gauge, the output quantity is

A. voltage✓
B. resistance
C. impedance
D. either voltage or resistance

116. The household energy meter is

A. indicating instrument
B. recording instrument
C. integrating instrument✓
D. none of the answers

117. Potentiometer method of dc voltage measurement is more accurate than direct measurement using a voltmeter because

A. it loads the circuit to maximum extent
B. it loads the circuit moderately
C. it does not load the circuit at all✓
D. it uses centre zero galvanometer instead of Voltmeters

118. Which of the following is true about an impulse voltage?

A. It is a unidirectional voltage✓
B. Chopped impulse flashover does not occur
C. Time taken to rise is equal to time taken to fall
D. RMS value is always less than 50% of average value

119. The bridge method commonly used for finding mutual inductance is

(A) Heaviside Campbell bridge✓ (B) Schering bridge

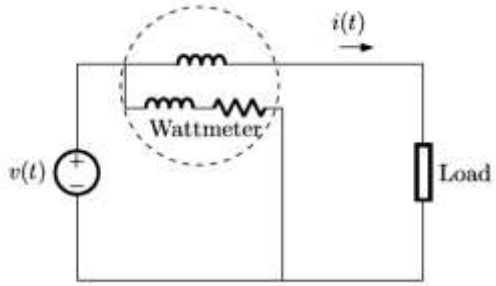
(C) De Sauty bridge (D) Wien bridge

120. For the circuit shown in the figure, the voltage and current expressions are

$$v(t) = E_1 \sin(\omega t) + E_3 \sin(3\omega t)$$

$$I(t) = I_1 \sin(\omega t - \emptyset_1) + I_3 \sin(3\omega t - \emptyset_3) + I_5 \sin(5\omega t)$$

The average power measured by the wattmeter is



A) $\frac{1}{2}E_1\ I_1 cos\emptyset_1$ B) $\frac{1}{2}[E_1\ I_1 cos\emptyset_1 + E_1\ I_3 cos\emptyset_3 + E_1\ I_5]$

C) $\frac{1}{2}[E_1\ I_1 cos\emptyset_1 + E_3\ I_3 cos\emptyset_3]$✓ D) $\frac{1}{2}[E_1\ I_1 cos\emptyset_1 + E_3\ I_1 cos\emptyset_1$

121. The items in Group-I represent the various types of measurements to be made with a reasonable accuracy using a suitable bridge. The items in Group-II represent the various bridges available for this purpose. Select the correct choice of the item in Group-II for the corresponding item in Group-I from the following

List-I	List-II
P. Resistance in the milli-ohm Range	1. Wheatstone Bridge
Q. Low values of Capacitance	2. Kelvin Double Bridge
R. Comparison of resistance which are nearly equal	3. Schering Bridge
S. Inductance of a coil with a large time-constant	4. Wien's Bridge
	5. Hay's Bridge
	6. Carey-Foster Bridge

A) P=2, Q=3, R=6, S=5✓ B) P=2, Q=6, R=4, S=5

C) P=2, Q= 3, R=5, S=4 D) P=1, Q=3, R=2, S=6

122. Resistance R1 and R2 have, respectively, nominal values of 10 Ω and 5 Ω, and tolerance of ±5% and ±10%. The range of values for the parallel combination of R1 and R2 is

A) 3.077 Ω to 3.636 Ω✓ B) 2.805 Ω to 3.371 Ω

C) 3.237 Ω to 3.678 Ω D) 3.192 Ω to 3.435 Ω

123. A dual trace oscilloscope is set to operate in the ALTernate mode. The control input of the multiplexer used in the y -circuit is fed with a signal having a frequency equal to

A) the highest frequency that the multiplexer can operate properly

B) twice the frequency of the time base (sweep) oscillator

C) the frequency of the time base (sweep) oscillator✓

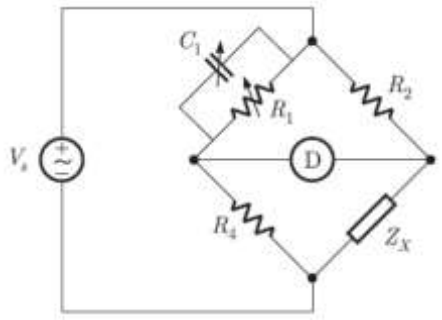
D) half the frequency of the time base (sweep) oscillator

124. A $4\frac{1}{2}$ digit DMM has the error specification as: 0.2% of reading + 10 counts. If a dc voltage of 100 V is read on its 200 V full scale, the maximum error that can be expected in the reading is

(A) ±0.1% (B) ±0.2%

(C) ±0.3%✓ (D) ±0.4%

125. The bridge circuit shown in the figure below is used for the measurement of an unknown element Z_X . The bridge circuit is best suited when Z_X is a



A) low resistance B) high resistance

C) low Q inductor✓ D) lossy capacitor

126. An analog voltmeter uses external multiplier settings. With a multiplier setting of 20 kΩ, it reads 440 V and with a multiplier setting of 80 kΩ, it reads 352 V. For a multiplier setting of 40 kΩ, the voltmeter reads

A) 371V B) 383 V

C) 394 V D) 406 V✓

127. An ammeter has a current range of 0-5 A, and its internal resistance is 0.2 Ω. In order to change the range to 0-25 A, we need to add a resistance of

A) 0.8 Ω in series with the meter

B) 1.0 Ω in series with the meter

C) 0.04 Ω in parallel with the meter

D) 0.05 Ω in parallel with the meter✓

128. The pressure coil of a dynamometer type wattmeter is

(A) Highly inductive (B) Highly resistive✓

(C) Purely resistive (D) Purely inductive

129. The two inputs of a CRO are fed with two stationary periodic signals. In the X-Y mode, the screen shows a figure which changes from ellipse to circle and back to ellipse with its major axis changing orientation slowly and repeatedly. The following inference can be made from this.

(A) The signals are not sinusoidal

(B) The amplitudes of the signals are very close but not equal

(C) The signals are sinusoidal with their frequencies very close but not

equal

(D) There is a constant but small phase difference between the signals✓

130. The inductance of a certain moving-iron ammeter is expressed as

L = 10 + 3θ − (θ2/4)μH , where θ is the deflection in radians from the zero position. The control spring torque is 25 10 6 # - Nm/radian. The deflection of the pointer in radian when the meter carries a current of 5 A, is

A) 2.4 B) 2.0

C) 1.2✓ D) 1.0

131. A 500A/5A, 50 Hz transformer has a bar primary. The secondary burden is a pure resistance of 1 Ω and it draws a current of 5 A. If the magnetic core requires 250 AT for magnetization, the percentage ratio error is

A) 10.56 B) −10.56✓

C) 11.80 D) −11.80

132. The effect of stray magnetic field on the actuating torque of a portable

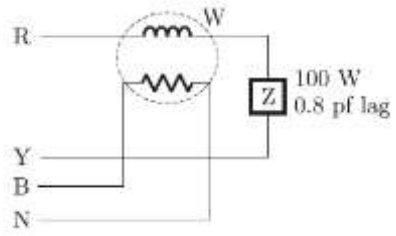
instrument is maximum when the operating field of the instrument and the stray fields are

A)perpendicular B) parallel✓

C) inclined at 60% D) inclined at 30%

133. A single-phase load is connected between R and Y terminals of a 415 V,

symmetrical, 3-phase, 4-wire system with phase sequence RYB. A wattmeter is connected in the system as shown in figure. The power factor of the load is 0.8 lagging. The wattmeter will read



A) −795 W B) −597 W✓

C) +597 W D) +795 W

134. A dc A-h meter is rated for 15 A, 250 V. The meter constant is 14.4 A-sec/ rev. The meter constant at rated voltage may be expressed as

A) 3750 rev/kWh B) 3600 rev/kWh

C) 1000 rev/kWh✓ D) 960 rev/kWh

135. A moving iron ammeter produces a full scale torque of 240 µNm with a

deflection of 120c at a current of 10 A . The rate of change of self induction (µH/radian) of the instrument at full scale is

A) 2.0 µH/radian B) 4.8 µH/radian✓

C) 12.0 µH/radian D) 114.6 µH/radian

136. Two in-phase, 50 Hz sinusoidal waveforms of unit amplitude are fed into

channel-1 and channel-2 respectively of an oscilloscope. Assuming that the voltage scale, time scale and other settings are exactly the same for both the channels, what would be observed if the oscilloscope is operated in X-Ymode ?

A) A circle of unit radius B) An ellipse

C) A parabola D) A straight line✓

137. R1 and R4 are the opposite arms of a Wheatstone bridge as are R3 and R2. The source voltage is applied across R1 and R3. Under balanced conditions which one of the following is true

A) R1 = R3R4 / R2 B) R1 = R2R3 / R4✓

C) R1 = R2R4 / R3 D) R1 = R2+ R3+ R4

138. A DC ammeter has a resistance of 0.1 Ω and its current range is 0-100 A.

If the range is to be extended to 0-500 A, then meter required the following shunt resistance

A) 0.010 Ω B) 0.011 Ω

C) 0.025 Ω✓ D) 1.0 Ω

139. Power consumed by a balanced 3-phase, 3-wire load is measured by the two wattmeter method. The first wattmeter reads twice that of the second. Then the load impedance angle in radians is

A)π/2 B) π/6

C) π/8✓ D) π/4

140. In an oscilloscope screen, linear sweep is applied at the

A) vertical axis B) horizontal axis✓

C) origin D) both horizontal and vertical axis

141. Consider the following statements

(i) The compensating coil of a low power factor wattmeter compensates the effect of the impedance of the current coil.

(ii) The compensating coil of a low power factor wattmeter compensates the effect of the impedance of the voltage coil circuit.

A)(i) is true but (ii) is false B) both (i) and (ii) are true

C)(i) is false but (ii) is true D) both (i) and (ii) are false

142. Cache memory is placed between the _____

a) CPU & Secondary memory b) CPU & Main memory

c) CPU & CD-ROM d) Main memory & Secondary memory

143. CPU execution for a program = _____

A) CPUclock cycles for a program X clock cycle time

B) CPUmachine cycles for a program X clock cycle time

C) CPUclock cycles for a program

D) None of the answer is correct

144. In a multimeter internal battery is required to measure

A) Voltage B) Resistance

C) current D) frequency

145. A potentiometer is basically a

A) Deflectional type instrument B) Null type instrument

C) both (a) & (b) D) a digital instrument

146. In the standard signal generator, The accuracy of the frequency , stability, and freedom from distortion depend on the

A) design of the oscillator B) design of the attenuator

C) None

147. Moving iron type of instrument can be used as

A) indicator type instruments as on panels

B) transfer type instruments

C) standard instruments for calibration of other instruments

D) All of the above

148. Swamping resistance is connected

A) in series with the shunt to reduce temperature error in shunted

ammeters.

B) in series with the ammeters to reduce errors on account of friction

C) in series with the meter and have a negligible resistance co-efficient in order to reduce temperature errors in shunted ammeters.

D) None

149	A ____ device prevents the oscillation of the moving system and enables the latter to reach its final position quickly a) Deflecting b) Controlling c) Damping✓ d) All the answers are correct
150	A moving-coil permanent magnet instrument can be used as ____ by using a low resistance shunt. a) Ammeter✓ b) Voltmeter c) Flux-meter d) Ballistic galvanometer
151	Induction type single phase energy meters measure electric energy in a) kW

	b) Wh c) kWh✓ d) VAR e) All the answers are wrong
152	Most common form of A.C. meters met with in every day domestic and industrial installations are a) Mercury motor meters b) Commutator motor meters c) Induction type single phase energy meters✓ d) All the answers are correct
153	The disadvantages of using multipliers with voltmeters at high voltages are: a) The power consumption of multipliers becomes large at large voltages b) The multipliers at high voltages have to be shielded in order to prevent capacitive currents✓ c) The metering circuit is not electrically from the power circuit d) All the answers are correct
154	The burden of current transformers is expressed in terms of: a) Secondary winding current b) VA rating of transformer✓ c) Voltage, current and power factor of secondary winding circuit d) All the answers are wrong
155	Clamp on meters are used because a) With their use it is possible to measure current flowing in a line without breaking the circuit.✓ b) Their accuracy is high c) It is not possible to measure voltage without them d) All the answers are correct.
156	In a Q meter the value of shunt resistance connected across the oscillator is typically of the order of` a) Ω ✓ b) mΩ c) μΩ d) kΩ
157	The Q factor of a coil at the resonant frequency 1.5 MHz of an RLS ceries circuit is 150. The bandwidth is: a) 225 MHz b) 1.06 MHz c) 10 kHz✓ d) All the answers are wrong
158	In a Q meter, distributed capacitance of coil is measured by changing the capacitance of the tuning capacitor. The values of tuning capacitor are C1 and C2 for resonant frequencies f1 ad 2f1 respectively. The value of distributed capacitance is: a) (C1 – C2) /2

	b) (C1 – 2C2)/3 c) (C1 – 4C2)/3✓ d) (C1 – 3C2)/2
159	The bandwidth of a CRO is from 0 – 20 MHz. The fastest rise time a sine wave can have to be accurately reproduced by the instrument is a) 35 ns b) 35 µs✓ c) 17.5 ns d) 0.175 µs
160	In a CRT the focusing anode is located a) Between pre-accelerating and accelerating anodes✓ b) Before accelerating anode c) Before pre-accelerating anode d) All the answers are wrong
161	In a digital storage oscilloscope, the input signals are a) Directly applied to the oscilloscope b) Multiplexed, converted to digital form and stored and applied to oscilloscope c) Multiplexed, converted to digital form, stored, converted to analog for and applied to oscilloscope d) Applied to amplifier, stored as analog signals, multiplexed, converted to digital form, stored in digital form, converted to analog form, and applied to CRO through an amplifier.
162	P_1 phosphor material is used for display in CRTs for a) Photographic applications b) General purpose applications c) Television applications d) All the answers are correct
163	If the distance of screen from a CRT to centre of deflection plates is 15 cm, the length of deflection plates is 2 cm, the distance between plates is 1 cm and accelerating voltage is 500 V, the deflection sensitivity is: a) 33.2 V/cm b) 0.03 cm/V c) 60.4 V/cm d) 0.015 cm/V✓
164	A vertical amplifier for a CRO can be designed for: a) Only a high gain b) Only a broad bandwidth c) A constant gain times bandwidth product✓ d) All the answers are correct
165	The desirable characteristics of a signal source are: a) The frequency of the signal should be well known and stable b) The amplitude of a signal source should be controllable from very

	small to relatively large values c) The output signal should be free from distortion d) All the answers are correct
166	The pulse rise time is defined as the time taken by the pulse a) To go from 10% to 90% of its amplitude✓ b) To go from 0% to 100% of its amplitude c) To go from 0% to 90% of its amplitude d) To go from 10% to 100% of its amplitude
167	A triangular waveshape is obtained a) By integrating a square wave b) By differentiating a sine wave c) By differentiating a square wave d) By integrating a sine wave
168	A voltage of 200 V at 5 Hz is applied to an electrodynamometer type of instrument which is spring controlled. The indication on the instrument is a) 200 V b) 0 V c) The instrument follows the variations in voltage and doses not give s steady response✓ d) All the answers are wrong
169	The operating magnetic field held in an electrodynamometer type of instrument has a flux density typically about a) 1 Wb/m^2 b) 0.5 Wb/m^2 c) 0.05 Wb/m^2 d) 0.005 Wb/m^2 ✓
170	A coordinated type potentiometer is used for determination of impedance of a coil and the results are: voltage across 1Ω resistor in series with coil, 0.24 V on in-phase dial and -0.09 V on quadrature dial, voltage across 10 : 1 potential divider used with coil 0.37 V on in-phase dial and 0.32 V on quadrature dial. The resistance of coil is: a) 9.14 Ω✓ b) 2.34 Ω c) 16.76 Ω d) All the answers are wrong
171	Sensitivity of a potentiometer can be increased by a) Decreasing the length of potentiometer wire b) increasing the length of potentiometer wire✓ c) Decreasing the current in potentiometer wire d) Decreasing the resistance in the rheostat in series with the battery
172	In measurements made using a Q-meter, high impedance elements should preferably connected in a) Star b) Delta✓

	c) Series d) Parallel
173	The power consumption in PMMC instruments is typically about a) 0.25 W to 2 W b) 0.25 mW to 2 mW c) 25 µW to 2 mW✓ d) All the answers are wrong
174	A resistance of value 10 Ω approximately is to be measured- voltmeter method with resistance of ammeter is 0.02 Ω and that of voltmeter is 5000 Ω. The resistance should be measured by a) Connecting the ammeter on the side of unknown resistance as this connection gives better accuracy✓ b) Connecting the voltmeter on the side of unknown resistance as this connection gives better accuracy c) Any of the two connections, as both of them give equal accuracy d) All the answers are wrong
175	The use of _____ instruments is merely confined within laboratories as standardizing instruments. a) Absolute✓ b) Indicating c) Recording d) Integrating e) All the answers are wrong
176	Which of the following instruments indicate the instantaneous value of the electrical quantity being measured at the time at which it is being measured? a) Absolute instruments b) Indicating instruments✓ c) Recording instruments d) Integrating instruments
177	____ instruments are those which measure the total quantity of electrical delivered in a particular time. a) Absolute b) Indicating c) Recording d) Integrating ✓
178	Which of the following are integrating instruments? a) Ammeters b) Voltmeters c) Wattmeters d) Ampere-hour and watt-hour meters✓

COMPREHENSIVE VIVA

1.) A transformer transforms _____
(a) frequency (b) voltage (c) current (d) voltage and current [d]

2.) The main purpose of using core in a transformer is to _____
(a) decrease iron losses (b) prevent eddy current loss (c) eliminate magnetic hysteresis (d) decrease reluctance of the common magnetic circuit. [d]

3.) Transformer cores are laminated in order to _____
(a) simplify its construction (b) minimize eddy current loss (c) reduce cost (d) reduce hysteresis loss. [b]

4.) The equivalent resistance of the primary of a transformer having k=5 and R1= 0.1 ohm when referred to secondary becomes _____ ohm.
(a) 0.5 (b) 0.02 (c) 0.004 (d) 2.5 [d]

5.) A 200 kVA transformer has an iron loss of 1 kW and full-load Cu loss of 2KW, its load kVA corresponding to maximum efficiency is _____ kVA.
(a) 100 (b) 141.1 (c) 50 (d) 200 [b]

6.) The main purpose of performing open-circuit test on a transformer is to measure its _____.
(a) Cu loss (b) core loss (c) total loss (d) insulation resistance. [b]

7.) 30^0 phase shift between primary and secondary phase voltage will be experienced on _____ connection of three phase transformer.
(a) Y-Y (b) Y-Δ (c) Δ-Y (d) both b & c [d]

8.) Condition for maximum power developed in a dc motor is _____
(a) $V = E_b/2$ (b) $V = E_b/4$ (c) $E_b = V/2$ (d) $V = 1/2$ [c]

9.)In _____ motor the speed increases as the load increases .
(a) Series (b) Shunt (c) Differential compound (d) Cumulative compound [c]

10.) _____ motor should not be started on no-load condition.
(a) Series (b) Shunt (c) Differential compound (d) Cumulative compound [a]

11.) Torque in a dc shunt motor is directly proportional to _____
(a) square of Ia (b) ΦIa (c) 2Ia (d) square of Φ [b]

12.) In _____ method of speed control the speed above the rated speed can be obtained.
(a) Armature rheostat (b) Field rheostat (c) Voltage control (d) None [b]

13.) _____ motor is suitable for cutting a metal plate in a lathe.
(a) Series (b) Shunt (c) Differential compound (d) Cumulative compound [d]

14.) The input to a dc shunt motor is 4 kW at 400V. The armature resistance is 1 ohm, neglecting the brush contact drop the back emf induced in the armature is _____
(a) 380 V (b) 390 V (c) 400 (d) 350 V [b]

15.) The expression for torque is given by _____
(a) $T_a = 0.159\phi Z I_a\left(\frac{A}{P}\right)$ (b) $T_a = 0.159\phi Z I_a\left(\frac{P}{A}\right)$ (c) $T_a = 0.159\phi N I_a\left(\frac{P}{A}\right)$ (d) $T_a = 0.159\phi Z\left(\frac{P}{A}\right)$ [b]

16.) _____ losses are determined by conducting Hopkinson test on DC machines.
(a) Constant losses (b) Armature copper loss (c) Field copper loss (d) stray loss [d]

17.) The transformer oil is used to _____
(a) decrease iron losses (b) prevent eddy current loss (c) eliminate magnetic hysteresis
(d) cool the transformer and also provides insulation. [d]

18.) _____ test is called as back to back test.
(a) Swinburnes test (b) OC and SC test on transformer
(c) Hopkinsons (d) Retardation test. [c]

19.) _____ losses are determined by conducting Swinburnes test conducted on DC machines.
(a) Constant losses (b) Armature copper loss (c) Field copper loss (d) stray loss [a]

20.) _____ test cannot be applied for series motor
(a) Swinburnes (b) field (c) Hopkinsons (d)Brake [a]

21.) A transformer has negative voltage regulation when its load power factor is ____
(a) zero (b) unity (c) leading (d) lagging [c]

22.) _____ starter is used to start a squirrel cage induction motor.
(a) Direct online (b) star-delta (c) three point (d) four point . [b]

23.) The number of parallel path in lap winding is _____ [a]
(a) equal to number of poles (b) equal to number of coils
(c) equal to two (d) equal to number of conductors.

24.) The voltage induced in the conductors of the DC generator is of _____ nature. [c]
(a) DC (b) Pulsating DC (c) AC (d) None

25.) The number of parallel path in wave winding is _____ [c]
(a) equal to number of poles (b) equal to number of coils (c) equal to two (d) equal to number of conductors.

26.) The commercial efficiency of a shunt generator is maximum when its variable loss equals _____.
(a) constant loss (b) stray loss
(c) iron loss (d) friction and windage loss [a]

27.)The critical resistance of the d.c. generator is the resistance of _____
(a) armature (b) field (c) load (d) brushes [b]

28.) Which of the following d.c. generator cannot build up on open-circuit?
(a) Shunt (b) Series (c) Short shunt (d) Long shunt [b]

29.) The main purpose of performing short-circuit test on a transformer is to measure its
(a) Cu loss (b) core loss (c) total loss (d) Insulation resistance [a]

30.) In a d.c. generator, the generated e.m.f is directly proportional to the
(a) speed (b) pole flux (c) number of armature parallel paths (d) both a & b [d]

31. State the essential condition for a self excitation a DC machines, to induce voltage

(a) armature voltage

(b) residual voltage

(c) back EMF

(d) all the answers are wrong (not sure could be b and d)

32. In a DC generator, the generated emf is directly proportional to the

(a) armature current

(b) pole flux (ans)

(c) number of parallel paths

(d) compensating windings

33. The speed of a DC motor can be controlled by varying

(a) its flux

(b) armature circuit resistance

(c) applied voltage

(d) all the answers are correct (ans)

34. In a DC series motor the electromagnetic torque developed is proportional to

(a) Ia (b) $\frac{1}{Ia}$ (c) $\frac{1}{Ia^2}$ (d) Ia^2 (ans)

35. The back e.m.f. of a dc motor :

(a) helps in energy conversion. (ans)

(b) aids the applied voltage.

(c) often exceeds the supply voltage.

(d) equal to supply voltage.

36. The motor equation is given by

(a) V=Eb-IaRa

(b) V=Eb+IaRa (ans)

(c) V=IaRa-V

(d) V=Eb x IaRa

37. A transformer transforms

(a) frequency

(b) voltage & current (ans)

(c) voltage

(d) current

38. The transformer will work on ……

(a) a.c. only (ans)

(b) d.c. only

(c) a.c. as well as d.c.

(d) All the answers are wrong

39. The primary and secondary of a transformer are …… coupled

(a) electrically

(b) magnetically (ans)

(c) electrically and magnetically

(d) none of the above

40. A turbo alternators uses_____

(a) salient pole field structure

(b) non-salient pole field structure (ans)

(c) rotating a.c. armature winding

(d) none of the above

41. Majority of the alternators in use have_____

(a) revolving a.c. armature winding

(b) stationary field type construction

(c) revolving field type construction (ans)

(d) all the answers are correct

42. The purpose of starting winding in a single phase induction motor is to _____

(a) reduce losses
(b) limit temperature rise of the machine
(c) produce rotating flux in conjunction with main winding (ans)
(d) avoid the oscillations

43. One of the characteristics of a single-phase motor is that it

(a) is self-starting

(b) is not self-starting (ans)

(c) requires only one winding

(d) can rotate in one direction only

44. The relationship among synchronous speed (Ns), rotor speed (N) and slip is _____

(a) N=(s-1) Ns

(b) N=(1-s) Ns (ans)

(c) N=(1+s) Ns

(d) N=s Ns

45. A motor which can conveniently be operated at lagging as well as leading power factors is the
(a) squirrel cage induction motor.
(b) wound rotor induction motor.
(c) synchronous motor. (ans)
(d) dc shunt motor.

46. Which of the following rotor requires damper winding?

(a) cylindrical rotor

(b) salient pole rotor (ans)

(c) both type rotor

(d) all the answers are wrong

47. Which of the following is not a necessary condition to be satisfied for synchronising an incoming alternator to an already operating alternator?

(a) same voltage magnitude

(b) same frequency

(c) same prime mover speed (ans)

(d) same phase sequence

48. A dc generator without commutator is a

(a) ac generator (ans)

(b) dc motor

(c) dc generator

(d) induction motor

49. When excitation is increased (over excitation), the synchronous generator operates at

(a) unity power factor

(b) leading power factor

(c) lagging power factor (ans)

(d) zero power factor

50. When slip is negative, then the motor is in which of the following region?

(a) motoring

(b) generating (ans)

(c) braking

(d) reversing

51	The nature of current flowing in the armature of a dc machine is								
	a	Dc	b	alternating	c	pulsating	d	None of these	b
52	Brushes are provided in dc machine for,								
	a	Providing a path for flow of current	b	Preventing sparking	c	Reducing the losses	d	None of these	a
53	The basic requirement of a dc armature winding is that it must be								
	a	a closed one	b	Open winding	c	Both (a) & (b)	d	None of these	a
54	The armature of a dc machine is laminated to reduce								
	a	Copper loss	b	Hysteresis loss	c	Eddy current loss	d	Friction &windage loss	c
55	The generated – emf for a dc generator with P poles, Z conductors and running at N rpm is given by								
	a	PΦZ/60A	b	PΦNZ/A	c	PΦNZ/60A	d	PΦNZ/60	c
56	Direction of induced emf in dc generator is given by								
	a	Fleming's right	b	Cork screw rule	c	Fleming's left hand	d	None of these	a

		hand rule				rule			
57	The commutator in dc generator is used for								
	a	Converting dc to ac	b	Converting ac to dc	c	Reducing friction	d	All of these	b
58	Wave winding is suitable for ----------current, ----------voltage dc generators								
	a	High, low	b	Low, high	c	Low, low	d	High, high	b
59	If the speed of the prime mover of the dc generator is increased, the generated emf								
	a	Increases	b	decreases	c	Remains constant	d	None of these	a
60	In dc machine, the constant losses								
	a	Copper losses	b	Magnetic losses	c	Commutator losses	d	None of these	b
61	A transformer core is laminated to								
	a	Reduce hysteresis loss	b	Reduce eddy current loss	c	Reduce copper loss	d	All of these	b
62	The transformer ratings are usually expressed in terms of								
	a	Volts	b	Amperes	c	kW	d	kVA	d
63	The function of conservator in a transformer is								
	a	To protect against internal fault	b	To reduce copper as well as core loss	c	To cool the transformer oil	d	To take care of the expansion and contraction	d
64	The value of flux involved in the emf equation of a transformer is								
	a	Average value	b	rms value	c	Peak value	d	Instantaneous value	c
65	A transformer having 1000 primary turns is connected to a 250 V a.c.supply. For a secondary voltage of 400 V, the number of secondary turns should be								
	a	1600	B	250	c	400	d	1250	a
66	The speed of a d.c. motor can be controlled by varying								
	a	It flux per pole	B	Resistance of armature circuit	c	Applied voltage	d	All of these	d
67	The commercial efficiency of a shunt generator is maximum when its constant loss equals ----------loss								
	a	Variable loss	B	Stray loss	c	iron	d	Friction & windage	a
68	The function transformer oil is								
	a	Insulation	A	cooling	c	Insulation and cooling	d	None of these	c
69	When a 400 Hz transformer is operated at 50 Hz, its kVA rating is								
	a	Reduced to 1/8	B	Increased 8 times	c	unaffected	d	None of these	a

70	The function of auto transformer is								
	a	Varying the voltage	b	Varying the load	c	Varying the frequency	d	None of these	a
71	What is the largest size of alternator being manufactured in India ?								
	a	500 MW	b	250 MW	c	210 MW	d	110 MW	a
72	A 12–pole alternator will pass through how many electrical degree in on complete revolution								
	a	60°	b	360°	c	1080°	d	2160	d
73	The stator of an alternator is laminated to reduce								
	a	Hysteresis loss	b	Copper losses	c	Mechanical loss	d	Eddy current loss	d
74	In modern alternators, the rotating part is								
	a	Field system	b	Armature	c	Armature as well as field system	d	None of these	a
75	The coil span factor for a 3-phase distributed winding with full pitch coil is								
	a	1.0	b	0.96	c	0.93	d	0.97	a
76	The effect of armature reaction upon the main field flux is								
	a	magnetizing	b	demagnetizing	c	Cross-magnetizing	d	Combination of all	d
77	The average emf generated per phase of a 3-phase alternator will full pitch coil is given by								
	a	$E_{ph}= 4.44f\Phi T_{ph}\, k_d$	b	$E_{ph}= 4.44f\Phi T_{ph}\, k_w$	c	$E_{ph}= 4f\Phi T_{ph}\, k_w$	d	$E_{ph}= 4f\Phi T_{ph}\, k_d$	a
78	A 3-phase double-layer stator winding has a coil span of 150 electrical degrees. Its coil span factor will be								
	a	0.96	a	1.0	c	0.966	d	0.98	
79	The advantages for doing parallel operation in alternators are								
	a	Continuity of service	b	Operation cost and efficiency	c	Maintenance , repair & additions to plant	d	All of these	d
80	A 50 Hz alternator will run at the greatest possible speed if it is wound for ---------- poles								
	a	8	b	6	c	2	d	4	c

SV-QP

81. The slip of an induction motor normally does not depend on

(A) rotor speed (B) synchronous speed
(C) shaft torque (D) core-loss component (ans)

82. In a single phase induction motor driving a fan load, the reason for having a high resistance rotor is to achieve

(A) low starting torque (B) quick acceleration(ans)
(C) high efficiency (D) reduced size

83. A 220 V, DC shunt motor is operating at a speed of 1440 rpm. The armature resistance is 1.0 Ω and armature current is 10 A. of the excitation of the machine is reduced by 10%, the extra resistance to be put in the armature circuit to maintain the same speed and torque will be

(A) 1.79 Ω
(B) 2.1Ω
(C) 18.9 Ω (ans)
(D) 3.1Ω

84. A three phase, salient pole synchronous motor is connected to an infinite bus. It is operated at no load a normal excitation. The field excitation of the motor is first reduced to zero and then increased in reverse direction gradually. Then the armature current:
(A) Increases continuously
(B) First increases and then decreases steeply(ans)
(C) First decreases and then increases steeply
(D) Remains constant

85. Distributed winding and short chording employed in AC machines will result in

(A) increase in emf and reduction in harmonics
(B) reduction in emf and increase in harmonics
(C) increase in both emf and harmonics
(D) reduction in both emf and harmonics (ans)

86. In transformers, which of the following statements is valid?

(A) In an open circuit test, copper losses are obtained while in short circuit test, core losses are obtained
(B) In an open circuit test, current is drawn at high power factor
(C) In a short circuit test, current is drawn at zero power factor
(D) In an open circuit test, current is drawn at low power factor (ans)

87. A synchronous generator is feeding a zero power factor (lagging) load at rated current. The armature reaction is

(A) magnetizing
(B) demagnetizing (ans)
(C) cross-magnetizing
(D) ineffective

88. For an induction motor, operation at a slip s , the ration of gross power output to air gap power is equal to

(A) $(1 - s)^2$
(B) $(1 - s)$(ans)
(C) $\sqrt{(1 - s)}$
(D) $(1 - \sqrt{s})$

89. In relation to the synchronous machines, which on of the following statements is false?

(A) In salient pole machines, the direct-axis synchronous reactance is greater than the quadrature-axis synchronous reactance.
(B) The damper bars help the synchronous motor self-start

(C) Short circuit ratio is the ratio of the field current required to produces the rated voltage on open circuit to the rated armature current (ans)
(D) The V-cure of a synchronous motor represents the variation in the armature current with field excitation, at a given output power

90. A single-phase induction motor with only the main winding excited would exhibit the following response at synchronous speed

(A) Rotor current is zero
(B) Rotor current is non-zero and is at slip frequency
(C) Forward and backward rotating fields are equal (ans)
(D) Forward rotating field is more than the backward rotating field

91. The core flux of a practical transformer with a resistive load

(A) is strictly constant with load changes (ans)
(B) increases linearly with load
(C) increases as the square root of the load
(D) decreases with increased load

92. An electric motor with "constant output power" will have a torque-speed characteristics in the form of a

(A) straight line through the origin
(B) straight line parallel to the speed axis
(C) circle about the origin
(D) rectangular hyperbola (ans)

93. What are the signs of load angle in an alternator during generator and motor operations, respectively?

(A) Negative, negative
(B) Positive, negative (ans)
(C) Negative, positive
(D) Positive, positive

94. In an alternator, the armature winding is kept stationary while the filed winding is kept rotating for the following reasons:
(i). Armature handles very large current and high voltage
(ii) Armature fabrication, involving deep slots to accommodate large coils, is easy if armature is kept stationary
(iii) It is easier to cool the stator than the rotor
Which of the above reasons are correct?

(A) (i) and (ii) only
(B) (i) and (iii) only
(C) (ii) and (iii) only
(D) All three options are correct (ans)

95. Increasing the air-gap of a squirrel-cage induction motor would result in

(A) Increase in no-load speed
(B) Increase in full-load power-factor
(C) Increase in magnetizing current (ans)
(D) Maximum available torque

96. If the capacitor of a capacitor-start single phase motor fails to open when the motor picks up speed,

(A) The motor will stop
(B) The auxiliary winding will be damaged
(C) The capacitor will be damaged (ans)
(D) The winding will be damaged

97. What is the material of slip-rings in an induction machine?

(A) Carbon (B) Nickel
(C) Phosphor bronze (D) Manganese

98. In a single-phase capacitor-start induction motor, the direction of rotation

(A) can be changed by reversing the main winding terminals
(B) cannot be changed
(C) is dependent on the size of the capacitor
(D) can be changed only in large capacity motors

99. A transformer may have negative voltage regulation if the load power factor(p.f) is

(A) Leading for some values of p.f
(B) Unity p.f
(C) Lagging but not zero p.f
(D) Only zero p.f lag

100. If the current in the armature od dc series motor is reduced to 5%, the torque of the motor will become

(A) 50% of the previous value
(B) 25% of the previous value
(C) 150% of the previous value
(D) 125% of the previous value

101. In a dc shunt motor, if the terminal voltage is reduced to half and torque remains the same, then

(A) speed will be half and armature current also will be half
(B) speed will be half but armature current remains the same

(C) speed will be half and armature current becomes double
(D) speed and armature current will remain the same

102. A 4 pole lap wound armature has 480 conductors and the flux per pole is 25mWb. The emf generated, when running at 600 rpm will be

(A) 240V
(B) 120V
(C) 60V
(D) 30V

103. When an electric train is moving down a hill , the dc motor acts as

(A) dc series motor
(B) dc shunt motor
(C) dc series generator
(D) dc shunt generator

104. The motor used for intermittent and high torque loads is

(A) dc shunt motor
(B) dc series motor
(C) differential compound motor
(D) cumulative compound motor

105. A transformer is working at its full load and its efficiency is also maximum. Its iron loss is 1000W. Then, its copper loss at half of full load will be

(A) 250W
(B) 300W
(C) 400W
(D) 500W

106. A 500kVA, 400V, three phase, 60Hz transformer is replaced by similar transformer of frequency 50Hz. Its rating will be

(A) 680 kVA
(B) 500 kVA
(C) 416 kVA
(D) None of the answers

107. The slip of a 500HP, 3 phase, 400V, 50 Hz induction motor is 5%. How many complete cycles will the rotor voltage make per minute?

(A) 1000
(B) 1200

(C) 1500
(D) 2000

108. For a three phase induction motor the input power on no-load is 600W and windage and friction loses is 183W. The stator copper loss will be equal to

(A) 783W
(B) 600W
(C) 183W
(D) 517W

109. In an induction motor, the motor fails to start when the number of rotor slots is equal to number of stator slots which is known as

(A) crawling
(B) cogging
(C) synchronous cusps
(D) Both A and C

110. If the input voltage and the frequency of supply is halved to a three phase induction motor

(A) the maximum torque is halved
(B) the maximum torque remains the same
(C) the air gap flux is halved
(D) both B and C

111. The core of a large transformer is built of
a) Cast steel
b) Cast iron
c) Silicon steel
d) Mild steel

112. The core of a transformer is laminated, which is lightly insulated by varnish in order to reduce
a. Hysteresis loss
b. Eddy current loss
c. Both hysteresis and eddy current loss
d. Core reluctance

113. In a single-phase core-type transformer, the winding leakage inductances are kept low by
a. Increasing the cross-sectional dimensions of the core
b. Sandwiching the LV and HV packets of both limbs

c. Placing the LV on one limb and the HV on the other
d. Placing half LV and half HV on each core limb

114. When high permeability core is used for a transformer in order, that
a. The magnetizing current has a low value
b. The magnetizing current has a low core loss
c. The magnetizing current has a low leakage reactance
d. The voltage ratio remains constant

115. In an ideal transformer the impedance transforms from one side to the other in
a. Direct square ratio of turns
b. Direct ratio of turns
c. Inverse square ratio of turns
d. Inverse ratio of turns

116. The no-load current in a transformer with respect to primary voltage
a. Leads by 90°
b. Lags by 90°
c. Leads by slightly less than 90°
d. Lags by slightly less than 90°

117. In a transformer the flux phasor
a. Leads the induced emf phasor by 90
b. Lags the induced emf phasor by 90
c. Is in phase with the induced emf phasor
d. Is in opposite to the induced emf phasor

118. The tests needed to be performed to determine the leakage reactance of a transformer are
a. OC Test
b. SC Test
c. Both OC and SC tests
d. Test by an impedance bridge

119. If the applied voltage of a transformer is increaded by 50% while it frequency is reduced to 50%, the core flux density will
a. Becomes three times
b. Become 3/4
c. Become 1/3
d. Remain the same

120. The power drawn by the primry winding of a transformer on no-load is predominantly absorbed in
a. Copper loss
b. Core loss
c. Copper loss plus core loss

d. Eddy current plus hysteresis loss

121. During SC test the power drawn by the primary winding is predominantly absorbed by
a. Copper loss
b. Core loss
c. Copper loss plus core loss
d. Eddy-current plus hysteresis loss

122. For a fixed primary voltage, how does the secondary terminal voltage of a transformer change if the pf of the reactive load reduces from 0.9 to 0.7 with constant load current?
a. No change
b. Voltage increase
c. Voltage reduces
d. Voltage increases as PF reduces and then reduces after reaching a max value

123. In a transformer zero voltage regulation is achieved at a load PF which is
a. Lagging
b. Leading
c. Unity
d. Zero

124. A 200/100 V transformer has a pu impedance of 0.05. The voltage needed to be applied on the HV side to circulate full-load current during short-circuit test is
a. 5 V
b. 10 V
c. 100 V
d. 200 V

125. If R = equivalent resistance, X = equivalent reactance, P_i = core loss, the current at which the transformer efficiency is maximum given by
a. $\sqrt{X/P_i}$
b. $\sqrt{R/P_i}$
c. $\sqrt{P_i/X}$
d. $\sqrt{P_i/R}$

126. If R = equivalent resistance, X = equivalent reactance, I = full load current, cosθ = pf leading, the voltage drop of a transformer from no-load to full load is given by
a. $I(R\ cos\theta - X\ sin\theta)$
b. $I(R\ cos\theta + X\ sin\theta)$
c. $I(R\ sin\theta - X\ cos\theta)$
d. $I(R\ sin\theta + X\ cos\theta)$

127. In an induction motor the rotor field runs with respect to the stator

a. at synchronous speed in the same direction as the stator field
b. at synchronous speed in the opposite direction as the stator field
c. at slip speed in the same direction as the stator field
d. at slip speed in the opposite direction as the stator field

128. A four pole, 50 Hz induction motor runs at a speed of 1440 rpm. The frequency of rotor current is
a. 3 Hz
b. 2.5 Hz
c. 2 Hz
d. 1 Hz

129. Pulsation loss in rotating machines occurs in the
a. Pole body
b. Stator and rotor cores
c. Armature teeth and pole body
d. Armature teeth and pole shoes

130. He armature of a DC machine is made of silica steel to
a. Reduce Hysteresis loss
b. Reduce Eddy current loss
c. Increase core permeability
d. Reduce both hysteresis and eddy current loss

131. The interpole winding in a DC machine is
a. Shunt connected
b. Series connected
c. Separately excited and
d. Short-circuited in operation

132. For traction type load the most suitable drive motor is the
a. Shunt motor
b. Series motor
c. Compound motor
d. Separately excited motor

133. The power drawn by a DC shunt motor on no-load comprises
a. Iron loss only
b. Mechanical loss only
c. Iron loss and mechanical loss
d. Copper loss only

134. Differential compound motor is used for
a. Traction type load
b. Nearly constant speed
c. Almost constant speed load

d. Fluctuating cyclic load

135. Synchronous motor speed is controlled by varying the
a. Field current
b. Supply voltage
c. Supply frequency
d. Both supply frequency and voltage

136. The armature reaction of a synchronous generator under short-circuit condition
a. Magnetizing
b. Cross-magnetizing
c. Demagnetizing
d. Both demagnetizing and cross-magnetizing

137. The synchronous reactance of a synchronous machine is
a. Same as leakage reactance
b. Reactance equivalent of its armature reaction
c. The sum of the reactance equivalent of its armature reaction and the leakage reactance
d. The difference of the reactance equivalent of its armature reaction and the leakage reactance
138. A synchronous motor draws 0.8 leading pf current. The armature reaction is
a. Magnetizing
b. Demagnetizing
c. Magnetizing and cross-magnetizing and
d. Demagnetizing and cross magnetizing
139. A synchronous machine is floating on infinite bus and no load. Its excitation is now increased. It will draw
a. Unity power factor current
b. Zero power factor lagging current
c. Zero power factor leading current
d. No current
140. A synchronous generator is rated 10 MVA, 11 kV, 0.85 pf, 50 Hz. What is the significance of 0.85 pf?
a. Load of pf more than 0.85 cannot be met
b. Load of pf less than 0.85 cannot be met
c. The primemover power rating is 8.5 MW
d. It does not have any significance

EEE 227 – AC MACHINES – COMPREHENSIVE VIVA EXAMINATION

141. The resistance representing mechanical output in the equivalent circuit of an induction motor as seen from stator is.

(a) $r_2'\left(\frac{1}{s}-1\right)1$ (b) $r_2'^2/s$

(c) $r_2^2\left(\frac{1}{s}-1\right)$ (d) r_2/s

142. As resistance is added in the rotor circuit of a slip ring motor:

(a) if maximum torque increases out occurs at the same slip.
(b) its maximum torque decreases but occurs at the same slip.
(c) its maximum torque remains the same and also occurs at lower slip.
(d) its maximum torque remains the same but occurs at higher slip.

143. The output line in an induction motor circle diagram is the line joining the tip of:

(a) the no-load current phasor to the point corresponding to slip = ∞
(b) the no-load current phasor to the point corresponding to slip = 1
(c) the short-circuit current phasor to the point corresponding to slip = ∞
(d) the short-circuit current phasor to the point corresponding to slip = 1.

144. The starting torque of an Induction Motor is …… than full load torque.

145. The starting current of an induction motor is five times the full load current while the full-load slip is 4%. The ratio of starting torque to full load torque is:

(a) 0.6 (b) 0.8 (c) 1.0 (d) 1.2

146. A synchronous motor with an under excited field has

(a) Leading power factor (b) Lagging power factor (c) Low synchronous speed (d) No effect.

147. The power factor of a synchronous motor can be varied by changing the

(a) Brush Polarity (b) Phase rotation (c) Speed of rotation (d) Field excitation

148. The damper winding in the synchronous motor is often used to

(a) Prevent hunting only (b) Prevent hunting & provide starting torque
(b) Maintain synchronism (d) Provide the starting torque only.

149. The coupling angle or load angle of a synchronous motor is defined as the angle between the

(a) Rotor and the stator poles of same polarity.
(b) Rotor and the stator poles of opposite polarity.
(c) Rotor and stator teeth.

150. For a synchronous machine with concentrated winding with full-pitch coil, which of the following is true?

(a) distribution factor, $K_d < 1$ and pitch factor, $K_p < 1$
(b) $K_d > 1$ and $K_p > 1$
(c) $K_d = 1$ and $K_p = 1$
(d) $K_d = 1$ and $K_p = 0$

151. The armature reaction of an alternator influences
a. Operating speed
b. Waveform
c. Windage losses
d. Emf/phase

152. A 3-phase, 50Hz, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 wb, sinusoidal distributed and the speed is 375 rpm. What is the phase and line voltage …… & ……..

153. The rotor preferred for alternators coupled to hydraulic turbines are
a. Salient pole type
b. Solid rotor type
c. Cylindrical rotor type

154. The distribution factor for a 36-slots, 4-pole, single-layer three-phase winding is
a. 0.99
b. 0.94
c. 0.96
d. 0.91

155. The voltage regulation of an alternator having 0.75 leading p.f load, no-load induced emf of 2400V and rated terminal voltage of 3000V is ……percent.
a. -26.7
b. 150
c. -20
d. 20

156. The potier triangle is used to separate
a. field mmf and armature mmf
b. iron loss and copper losses
c. copper loss and windage losses
d. armature leakage reactance and armature reaction mmf

157. A winding having 24 slots, 4 poles with coil span of 1 to 6, will have pitch factor as,
a. 0.6678
b. 0.7355
c. 0.8655
d. 0.9659

158. An alternator connected to infinite busbars. Its excitation is increased while driving power remains constant. This is likely to result in
a. less lagging power factor
b. None of the above
c. More lagging power factor
d. Terminal voltage drop

159. In which coil the harmonic component of the generated emf will be more?
a. Full pitch coil
b. Short pitch coil
c. Long pitch coil
d. Same in all coils

160. When speed of an alternator is changed from 3600 r.p.m. to 1800 r.p.m., the generated e.m.f./phases will become
a. four times
b. Twice

c. one-fourth
d. one-half

CONTROL SYSTEMS

1. Which one of the following statements regarding a linear system $y = f(x)$ are correct
   i. $f(x_1 + x_2) = f(x_1) + f(x_2)$
   ii. $f[x(t+T)] = f[x(t)] + f[x(T)]$
   iii. $f(Kx) = K\,f(x)$
   a. i, ii& iii are correct b. i & ii are correct
   c. i & iii are correct✓ d. iii alone is correct

2. Which one of the following is open loop?
   a. The respiratory system of man
   b. Traffic Light Control✓
   c. A thermostatic control
   d. A system for controlling the movement of the slide of a copying milling machine

3. In the following block diagram Fig 1 $G_1 = \frac{10}{s}$ and $G_2 = \frac{10}{s+1}$. $H_2 = 1$ and $H_1 = S + 3$. Find C/R

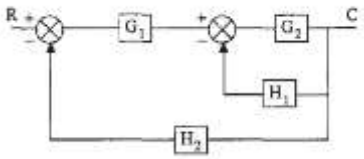


Fig 1

a. $\frac{100}{11S^2+31S+10}$ b. $\frac{10}{11S^2+31S+100}$ c. $\frac{100}{11S^2+31S+100}$✓ d. $\frac{100}{11S^2+31S}$

4. Which of the following relate to rational transfer function of a system?

   (i) Ratio of Fourier transform of output to input with zero initial conditions
   (ii) Ratio of Laplace transform of output to input with zero initial conditions
   (iii) Laplace transform of system impulse response
   (iv) Laplace transform of system unit step response
   a. i and iv b. ii and iii✓ c. i and iii d. ii and iv

5. Find the number of forward paths and the number of non-touching loop pairs for the signal flow graph in Fig 2

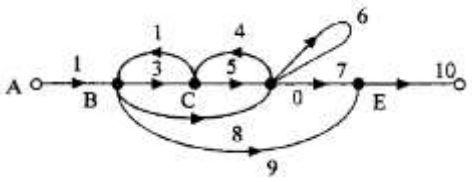


Fig 2

a. 3,1✓ b. 3,2 c. 2,2 d. 2,3

6. Find $V_0(s)/V_i(s)$ for the electrical network shown in Fig 3

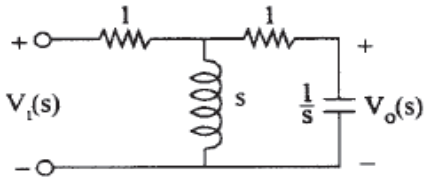


Fig 3

a. $\frac{s+1}{s^2+2s+1}$ b. $\frac{s}{2s^2+2s+1}$✓ c. $\frac{2s+1}{2s^2+2s+1}$ d. $\frac{s}{s^2+2s+3}$

7. Feedback Control Systems are
   a. Insensitive to both forward and feedback path parameter changes
   b. Less sensitive to feedback - path parameter changes than to forward – path parameter changes
   c. Less sensitive to forward - path parameter changes than to feedback – path parameter changes✓
   d. Equally sensitive to both forward and feedback path parameter changes

8. For a feedback control system of type 2, the steady state error for a ramp input is

   a. Infinite b. constant c. zero✓ d. indeterminate

9. The impulse response of the system is $5e^{-10t}$. Its step response is equal to

   a. $0.5\,e^{-10t}$ b. $0.5(1-e^{-10t})$✓ c. $5(1-e^{-10t})$ d. $10(1-e^{-10t})$

10. The system with open loop transfer function $G(s)H(s) = \frac{1}{s(s+1)}$ is
    a. type- 2 ; order -1 c. type- 1; order-1
    b. type- 0; order -0 d. type- 1 ;order -2✓

11. Consider the unit step –response of a unity – feedback control system whose open – loop transfer function is $G(s)=\frac{1}{s(s+1)}$ The maximum overshoot is equal to

    a.1.143 b. 0.153 c. 0.163✓ d. 0.173

12. The transfer function of an unity feedback system is given by $\frac{10}{(s+1)}$. Find the steady state error to the unit step input

a. zero b. $\frac{1}{11}$✓ c. 10 d. infinity

13. The characteristic equation of a feedback control system is $s^3 + 3s^2 + 3s + K$. For the system to be stable, what should be the value of K

a. -6 b. 15 c. 5 d. 12

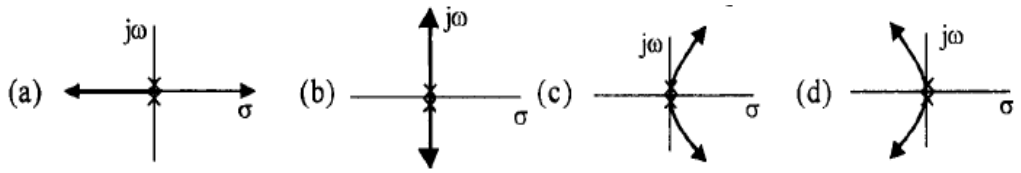
14. While forming the Routh Array, the situation of a row of zeros indicates that the system

a. has symmetrically located roots✓ c. is not sensitive to variations inn gain
b. is stable d. unstable

15. An unity feedback system has an open loop transfer function $\frac{K(s+6)}{(s+3)(s+5)}$. The break away and break in points of the root locus plot occurs at

a. -2 and -1 b. -4.27 and -7.33✓ c. -2.47 and -3.77 d. -3 and -4

16. An unity feedback system has an open loop transfer function $G(s) = \frac{K}{S^2}$. The root locus plot is **ANSWER----→(B)**

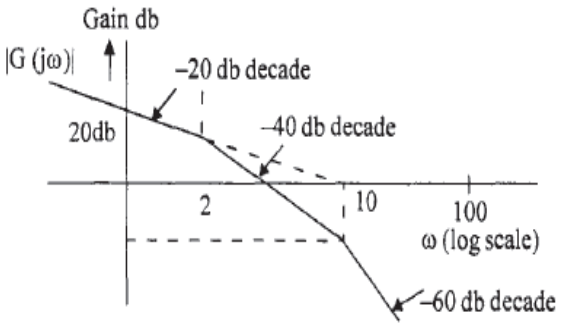


ans b

17. An open loop transfer function of a unity feedback system has two finite zeros, two poles at origin and two pairs of complex conjugate poles. The slope of high frequency asymptote in bode magnitude plot will be

a. +40 dB/decade b. 0 dB/decade c. -40 dB/decade✓ d. -80 dB/decade

18. The bode plot shown in figure has $G(j\omega)$



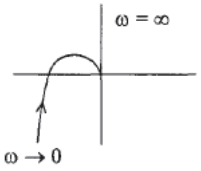
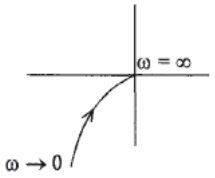
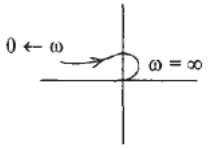
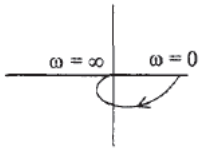
a. $\frac{100}{j\omega(1+0.5j\omega)(1+0.1j\omega)}$

c. $\frac{10}{j\omega(1+2j\omega)(1+10j\omega)}$

b. $\frac{10}{j\omega(1+0.5j\omega)(1+0.1j\omega)}$ ✓

d. $\frac{100}{j\omega(2+j\omega)(10+j\omega)}$

19. List I and List II show the transfer function and polar plots respectively. Match List I and List II and select the correct answer.

List I		List II
A. $\frac{1}{s(1+sT)}$	1.	
B. $\frac{1}{(1+sT_1)(1+sT_2)}$	2.	
C. $\frac{1}{s(1+sT_1)(1+sT_2)}$	3.	
D. $\frac{1}{s^2(1+sT_1)(1+sT_2)}$	4.	

a. A-2, B-1, C-4, D-3

b. A-3, B-4, C-1, D-2

b. A-2, B-4, C-1, D-3✓

d. A-3, B-1, C-4, D-2

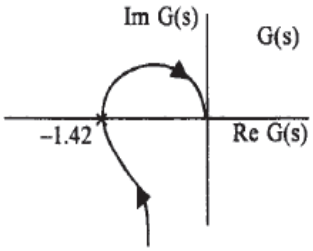
20. Which one of the following statements regarding the stability of a feedback control system is correct?

a. Gain Margin (GM) gives complete information about the relative stability of the system
b. Phase Margin (PM) gives complete information about the relative stability of the system
c. GM and PM together gives information about the relative stability of the system✓
d. Cross over frequencies give information about the relative stability of the system

21. The characteristic equation of a closed loop control system is given by $S^2 + 4S + 16$. The resonant frequency in radians per second of the system is

a. 2 b. 2√2 c. 4✓ d. 2 √3

22. The polar plot of type -1, 3 pole open loop system is shown in figure. The closed loop system



a. Unstable with one pole on the right half of s – plane
b. Unstable with two poles on the right half of s – plane
c marginallystable✓
d. always unstable

23. Indicate which one of the following transfer function represents the phase lead compensator

a. $\frac{S+1}{S+2}$✓ b. $\frac{6S+3}{6S+2}$ c. $\frac{S+5}{3S+2}$ d. $\frac{S+8}{S^2+5S+6}$

24. The transfer function of a compensating network is of the form $\frac{1+\propto TS}{1+TS}$ If this is a phase-lag network the value of $\propto$ should be

a. exactly equal to 0
b. between 0 and 1
c. exactly equal to 1
d. greater than 1✓

25. A phase-lag compensation will

a. improve relative stability
b. increase bandwidth
c. increase the speed of response
d. increase overshoot✓

26. The transfer function of a multi-input multi-output system, with the state-space representation of $\dot{x} = Ax + Bu$ & $y = Cx + Du$ where X represents the state, Y the output and U the input vector, will be given by

a. $C(SI - A)^{-1}B$
b. $C(SI - A)^{-1}B + D$✓
c. $(SI - A)^{-1}B$
d. $(SI - A)^{-1}B + D$

27. The state transition matrix for the system $\dot{x} = Ax$ with initial state *x*(0) is

a. $(SI - A)^{-1}$
b. $e^{At}x(0)$ ✓
c. Laplace inverse of [$(SI - A)^{-1}$]
d. Laplace inverse of $[(SI - A)^{-1}X(0)]$

28. Consider the system $\dot{x} = \begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix} x(t) + \begin{bmatrix}b_1\\ b_2\end{bmatrix} u(t)$; $y(t) = [d_1\ d_2]\, x(t)$. The conditions for complete observability is

a) $d_1 \neq 0$, $b_2 \neq 0$, b_1 and d_2 can be anything
b) $d_1 > 0$, $d_2 > 0$, b_1 and b_2 can be anything✓
c) $b_1 \neq 0$, $b_2 \neq 0$, d_1 and d_2 can be anything
d) $b_1 > 0$, $b_2 > 0$, d_1 and d_2 can be anything

29. A system is described by the state equation $\dot{x} = \begin{bmatrix}2 & 0\\ 0 & 2\end{bmatrix} x + \begin{bmatrix}1\\ 1\end{bmatrix} u$. The state transition matrix of the system is

a) $\begin{bmatrix}e^{2t} & 0\\ 0 & e^{2t}\end{bmatrix}$✓ b) $\begin{bmatrix}e^{-2t} & 0\\ 0 & e^{-t}\end{bmatrix}$ c) $\begin{bmatrix}e^{2t} & 1\\ 0 & e^{2t}\end{bmatrix}$ d) $\begin{bmatrix}e^{-2t} & 0\\ 0 & e^{-2t}\end{bmatrix}$

30. The value of A matrix in $\dot{x} = A x$ for the system described by the differential equation $\ddot{y} + 2\dot{y} + 3y = 0$ form is

a) $\begin{bmatrix}1 & 0\\ -2 & -1\end{bmatrix}$ b) $\begin{bmatrix}1 & 0\\ -1 & -2\end{bmatrix}$ c) $\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}$ d) $\begin{bmatrix}0 & 1\\ -3 & -2\end{bmatrix}$✓

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31. The unit step response of second order under damped system exhibits peak overshoot of 15%. If the magnitude of the input is doubled, the peak overshoot will be

(a) 30% (b) 15%✓ (c) 7.5 % (d) 18% (d) None of these

32. (-a + jb) are the complex conjugate roots of the characteristic equation of a second order system. Its damping ratio and natural frequency will be, respectively,

(a) $\frac{b}{\sqrt{a^2+b^2}}$ and $\sqrt{a^2+b^2}$ (b) $\frac{b}{\sqrt{a^2+b^2}}$ and a^2+b^2 (c) $\frac{a}{\sqrt{a^2+b^2}}$ and a^2+b^2

(d) $\frac{a}{\sqrt{a^2+b^2}}$ and $\sqrt{a^2+b^2}$ ✓ (e) None of these

33. For Type-3 system steady state error due to unit parabolic input is

(a) Infinite (b) Finite (c) Zero✓ (d) None of these

34. As the damping ratio of an under damped second order system increases, peak over shoot

(a) increases (b) remains constant (c) decreases✓ (d) None of these

35. A unity feedback control system has a forward path transfer function $G(s) = \frac{10(1+4s)}{s^2(1+s)}$. If the system is subjected to an input r(t) = (1+t+0.5t^2) u(t), the steady state error of the system is

(a) 0.10✓ (b) 10 (c) zero (d) infinity

36. The characteristic equation of a unity feedback system is 0.1s^2 + s + 10 = 0. the steady state error of the system to unit ramp is

(a) 1 (b)10 (c) 0.1✓ (d) 0.2 (e) None of these

37. In a second order under damped system with damping ration of δ and natural frequency of ω_n, the second over shoot occurs at a time t =

(a) $\frac{2\pi}{\omega_n\sqrt{1-\delta^2}}$ (b) $\frac{2\pi\omega_n}{\sqrt{1-\delta^2}}$ (c) $\frac{3\pi}{\omega_n\sqrt{1-\delta^2}}$ (d) $\frac{3\pi\omega_n}{\sqrt{1-\delta^2}}$ (e) None of these

38. The forward path gain of a unity feedback system is $G(s) = \frac{100}{s(12+s)}$. The peak time in seconds is

(a) π/10 (b) 8π (c) π/8✓ (d) π/6 (e) None of these

39. The forward path gain of a unity feedback system is $G(s) = \frac{100}{s(12+s)}$. The damped natural frequency in rad/sec is

(a) 10 (b) 0.8 (c) 8✓ (d) 6 (e) None of these

40. The transfer function of system is $\frac{C(s)}{R(s)} = \frac{100(1+s)}{2+s}$. The corner frequencies will be.

(a). -1, -2 (b). 1, 2✓ (c).1, 0.5 (d). None of these

41. Gain cross over frequency is the frequency at which

(a). Magnitude is 0 db✓ (b) magnitudes is 1db (c) phase is 180^0

(d). phase is -180^0

42. The transfer function of an derivative compensator is given by

(a). 1/s✓ (b). 1/s^2(c). s (d). s^2

43. The lag compensator has a

(a). zero nearer to orign (b) pole nearer to origin✓ (c) pole at origin (d). zero at origin

44. The initial slope of the Bode plot for a transfer function having three poles at orgin is

(a). 60 db/decade (b) 20db/decade (c) -60db/decade✓ (d). -20db/decade

45. The phase angle for G(s)=s is ----------

(a). -45^0 (b). $+45^0$ ✓ (c). 90^0 (d). -90^0

46. If both GM and PM are positive
(a). stable✓ (b). Unstable (c). Marginally stable (d). All of these

47. Transfer function without poles and zeros in the RHS of s-plane
(a). Maximum phase (b). Minimum phase✓ (c). All phase

(d). None of the these

48. The Bode plot of function jω has slope of ----------
(a). -20db/decade✓ (b). 20 db /decade (c). 6 db/decade (d). 40db/decade

49. The transfer function of a system is $\frac{100(1+0.5s)}{(1+0.05s)}$. The corner frequencies will be
(a). -2, -20 (b). 20, 2✓ (c). 0.05, 0.5 (d). -0.05, -0.5

50. The P controller improves
(a) transient and steady state response (b). Transient response

(c). Steady state response✓ (d). None of these

51. Resonant peak will not occur for damping ratio
(a). > 0.5 (b). >1.414 (c). >0.707✓ (d).>0

52. PD controller improves
(a) transient and steady state response (b). Transient response✓

(c). Steady state response (d). None of these

53. The lead compensator has a
(a). zero nearer to orign✓ (b) pole nearer to origin (c) pole at origin (d). zero at origin

54. Gain cross over frequency of polar plot is the point where plot touches
(a). 0 db✓ (b) unit circle (c) 180^0 (d). -180^0

55. The magnitude equation of s+a for drawing polar plot is
(a). $\sqrt{(\omega^2+a^2)}$ ✓ (b). ω^2+a^2 (c). $1/(\omega^2+a^2)$ (d). $1/\sqrt{(\omega^2+a^2)}$

56. The unit step response of a first order system is 0.865 at 2 seconds. The 5% settling time [in seconds] of the system is
(a) 2 (b) 3 (c) 4 (d) 5

57. Consider a CE. $s^3+34.5s^2+7500s+7500K=0$ to be stable. Find the range of K for a system to be stable

(a). -2.53, 0.53 (b). 0<K<3.5 (c) 0<K<34.5 ✓ (d). All of these

58. Determine the position error coefficient for the open loop transfer function $G(s) = \frac{K}{s^2(s+10)(s+500)}$

(a). Infinity✓ (b) K/5000 (c) Zero (d). None of these

59. The stability of a system

(a). decreases as the type no of system increases✓

(b). increases as the type no of system increases

(c).does not change with type no of a system (d). All of these

60. The nature of time time response if poles are real and distinct

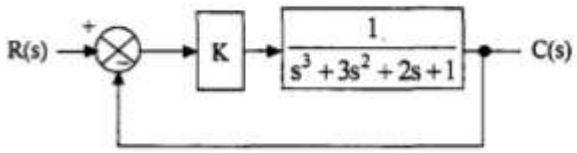
(a). critically damped (b). over damped✓ (c) undamped

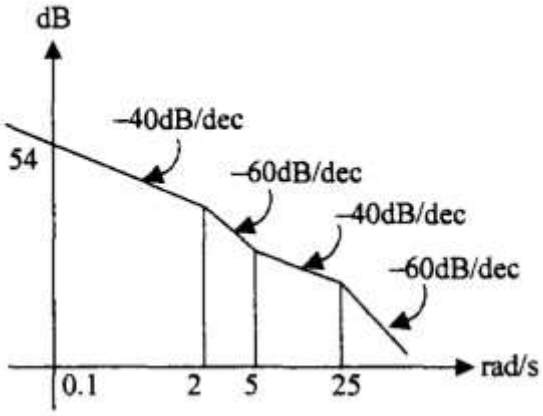
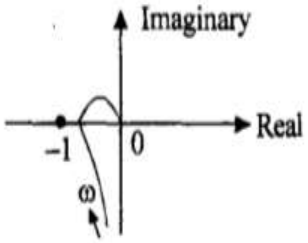
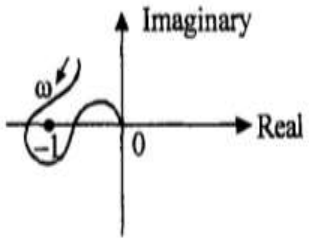
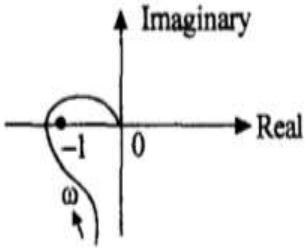
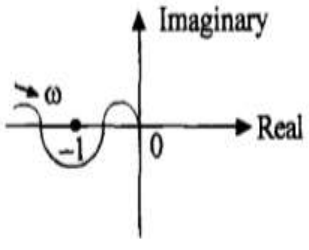
(d).Under damped

sl.no	Questions
61	When a human being tries to approach an object, his brain acts as (a) an error measuring device (b) a controller✓ (c) an actuator (d) an amplifier
62	The transfer function of the system described by $\frac{dy^2}{dt^2} + \frac{dy}{dt} = \frac{du}{dt} + 2u$ with 'u' as input and 'y' as output is (a) $\frac{(s+2)}{(s^2+s)}$ (b) $\frac{(s+1)}{(s^2+s)}$ ✓ (c) $\frac{2}{(s^2+s)}$ (d) $\frac{2s}{(s^2+s)}$
63	Feedback control systems are (a) Insensitive to both forward and feedback path parameter changes (b) Less sensitive to feedback path parameter changes than to forward path parameter changes (c) Less sensitive to forward path parameter changes than to feedback path parameter changes✓ (d) Equally sensitive to forward and feedback parameter changes

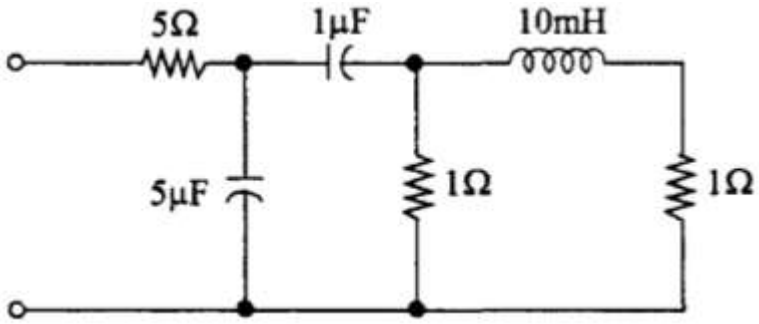
64	Consider the unit step response of a unity feedback control system whose open loop transfer function is $G(s)=\frac{1}{s(s+1)}$. The maximum overshoot is equal to (a) 1.143 (b) 0.153 (c) 0.163✓ (d) 0.173
65	The closed loop transfer function of a control system is given by $\frac{C(s)}{R(s)}=\frac{1}{1+s}$. For the input $r(t)=\sin t$, the steady state value of $c(t)$ is equal to (a) $\frac{1}{\sqrt{2}}\cos t$ ✓ (b) 1 (c) $\frac{1}{\sqrt{2}}\sin t$ (d) $\frac{1}{\sqrt{2}}\sin(t-\frac{\pi}{4})$
66	A unity feedback system has open loop transfer function $G(s)$. The steady state error is zero for (a) Step input and type-1 $G(s)$ ✓ (b) ramp input and type-1 $G(s)$ (c) Step input and type-0 $G(s)$ (d) ramp input and type-0 $G(s)$
67	Introduction of integral action in the forward path of a unity feedback system results in a (a) Marginally stable system (b) System with no steady state error✓ (c) System with increased stability margin (d) System with better speed of response
68	When the input to a system as withdrawn at $t=0$,its output was found to decrease exponentially from 1000 units to 500 units in 1,386 seconds, the time constant of the system is

	(a) 0.500 (c) 1.386	(b) 0.693✓ (d) 2.000
69	The unit impulse response of a linear time –invariant second order system is $g(t) = 10e^{-8t}\sin 6t(t \geq 0)$. the natural frequency and damping factor of the system is (a) 10 rad/s and 0.6 (c) 5 rad/s and 0.6	(b) 10 rad/s and 0.8✓ (d) 6 rad/s and 0.6
70	The steady state error due to a ramp input for a type to system is equal to (a) Zero✓ (c) n0n-zero number	(b) infinite (d) constant
71	In the derivative error compensation (a) damping decreases and settling time decreases (c) damping decreases and settling time increases	(b) damping increases and settling time increases (d) damping increases and settling time decreases✓
72	In the type 1 system, the velocity error is (a) inversely proportional to bandwidth (c) inversely proportional to error constant✓	(b) directly proportional to error constant (d) independent of error constant
73	A plant has the following transfer function $G(s) = \frac{1}{(s^2 + 0.2s + 1)}$ for a step input it is required that the response settles to within 2% of its final value. The plant settling time is (a) 20 sec (c) 35 sec	(b) 40 sec✓ (d) 45 sec
74	A system has open loop transfer function $G(s) = \frac{10}{s(s+1)(s+2)}$ .What is the steady state error when it is subjected to the input $r(t) = 1 + 2t + \frac{3}{2}t^2$. (a) Zero (c) 4	(b) 0.4 (d) Infinity ✓
75	A control system having unit damping factor will give	

	(a) Critically damped response✓ (b) Oscillatory response (c) Undamped response (d) No response
76	The number of roots of the equation $2s^4 + s^3 + 3s^2 + 5s + 7 = 0$ that lie in the right half of s plane is (a) 0 (b) 1 (c) 2✓ (d) 3
77	The open loop transfer function of a system is given by $G(s) = \frac{K}{S(S+2)(S+4)}$. The maximum value of K for which the unity feedback system will be stable is (a) 16 (b) 32✓ (c) 48 (d) 64
78	A control system is as shown in the given figure. The maximum value of gain K for which the system is stable is  (a) $\sqrt{3}$ (b) 3 (c) 4✓ (d) 5
79	A unity feedback system has $G(s) = \frac{K}{s(s+1)(s+2)}$ in the root locus ,the break-away point occurs between (a) $s = 0$ and -1✓ (b) $s = -1$ and $-\infty$ (c) $s = -1$ and -2 (d) $s = -2$ and $-\infty$
80	The intersection of asymptotes of root-loci of a system with open-loop transfer function $G(s)H(s) = \frac{K}{s(s+1)(s+3)}$ is

	(a) 1.44 (b) 1.33 (c) -1.44 (d) -1.33✓
81	The asymptotic approximation of the lo-magnitude versus frequency plot of minimum phase system with real poles and one zero is show in figure. its transfer function is  (a) $\frac{20(s+5)}{s(s+2)(s+25)}$ (b) $\frac{10(s+5)}{s(s+2)(s+25)}$ (c) $\frac{20(s+5)}{s^2(s+2)(s+25)}$ (d) $\frac{50(s+5)}{s^2(s+2)(s+25)}$ ✓
82	Consider the following Nyquist plots of different control systems which of this plot's represent stable systems? 1.  2.  3.  4.  (a) 1 alone (b) 2,3 and 4

	(c) 1,3 and 4✓	(d) 1,2 and 4
83	The phase lead compensation is used to (a) Increase rise time and decrease overshoot (b) decrease both rise time and overshoot ✓ (c) increase both rise time and overshoot (d) decrease rise time and increase overshoot	
84	A phase lag compensation will (a) improve relative stability (b) increase the speed of response (c) increase bandwidth (d) increase overshoot✓	
85	The state transition matrix for the system $\dot{X} = AX$ with initial state X(0) is (a) $(sI - A)^{-1}$ (b) $e^{At}X(0)$ ✓ (c) Laplace inverse of $[(sI - A)^{-1}]$ (d) Laplace inverse of $[(sI - A)^{-1}X(0)]$	
86	A transfer function of a control system does not have pole-zero cancellation. which one of the following statement is true? (a) System is neither controllable nor observable (b) System is completely✓ controllable and observable (c) System is observable but uncontrollable (d) System is controllable but unobservable	
87	The zero input response of a system, $\dot{X} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} X$ with $X(0) = \begin{bmatrix} 1 & 0 \end{bmatrix}^T$ is (a) $\begin{bmatrix} te^t \\ t \end{bmatrix}$ (b) $\begin{bmatrix} e^t \\ te^t \end{bmatrix}$ ✓	

	(c) $\begin{bmatrix} e^t \\ t \end{bmatrix}$ (d) $\begin{bmatrix} t \\ te^t \end{bmatrix}$
88	For the system $\dot{X} = \begin{bmatrix} 2 & 3 \\ 0 & 5 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} U$, which of the following statement is true?? (a) The system is controllable but unstable (b) The system is uncontrollable but unstable✓ (c) The system is controllable but stable (d) The system is uncontrollable but stable
89	The minimum number of states necessary to describe the network shown in figure in a state variable form is  (a) 2 (b) 3✓ (c) 4 (d) 6
90	The second order system $\dot{X} = AX$ has $A = \begin{bmatrix} -1 & -1 \\ 1 & 0 \end{bmatrix}$.The values of its damping factor ξ and natural frequency ω_n are respectively (a) 1 and 1 (b) 0.5 and 1 (c) 0.707 and 2 (d) 1 and 2

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91. The transfer function of a linear system is the

(a) ratio of the output, $V_o(t)$ and input $V_i(t)$.

(b)ratio of the derivatives of the output and the input.

(c) ratio of the Laplace transform of the output and that of the input with all initial

conditions zeros. ✓

(d)none of these

92. The open-loop DC gain of a unity negative feedback system with closed loop transfer

Function $\frac{s+4}{s2+7s+13}$ is

(a) 4/13 (b)4/9✓ (c) 4 (d)13

93. A system described by the following differential equation is d^2y/dt^2 +3dy/dt+2y=x(t) is initially at rest. For input $(t) = 2u(t)$, the output y(t) is

(a) $(1 - 2e^{-t} + e^{-2t})(t)$✓

(b) $(1 + 2e^{-t} - 2e^{-2t})(t)$

(c) $(0.5 + e^{-t} + 1.5e^{-2t})(t)$

(d) $(0.5 + 2e^{-t} + 2e^{-2t})$

94. The unit-step response of a system starting from rest is given by $(t) = 1 - e^{-2t}$ for $t \geq 0$

The transfer function of the system is

(a)$\frac{1}{1+2s}$ (b) $\frac{1}{2+s}$(c) $\frac{2}{2+s}$✓ (d) $\frac{2s}{1+2s}$

95. The unit impulse response of a system is $h(t) = e^{-t}, t \geq 0$ For this system, the steady-state value of the output for unit step input is equal to

(a) −1 (b)0 (c) 1✓ (d)∞

96. The steady state error of a stable 'type 0' unity feedback system for a unit step function is

(a) 0 (b) $1/1+K_p$ ✓ (c) ∞ (d) $1/K_p$.

97. A unity-feedback control system has the open-loop transfer function $(s) = \frac{4(1+2s)}{s2(s+2)}$ if the input to the system is a unity ramp, the steady-state error will be

(a) 0✓ (b)0.5 (c) 2 (d)Infinity

98. The step error coefficient of a system $(s) = \frac{1}{(s+6)(s+1)}$ with unity feedback is

(a) 1/6✓ (b)∞ (c) 0 (d)1

99. Consider a unity feedback control system with open-loop transfer function $(s) = \frac{K}{s(s+1)}$ the steady state error of the system due to a unit step input is

(a) Zero✓ (b) K (c) 1/K (d) infinite

100. A second-order system has transfer function given by (s) =25/ s^2 +8s+25

If the system, initially at rest, is subjected to a unit step input at t = 0, the second peak in the response will occur at

(a) $\pi\ sec$✓ (b)$\pi/3\ sec$ (c) $2\pi/3\ sec$ (d)$\pi/2\ sec$

101. For a second order system, damping ratio (ξ),s $0 < \xi < 1$, then the roots of the characteristic polynomial are

(a) real but not equal✓ (b) real and equal (c) complex conjugates (d) imaginary

102. The final value theorem is used to find the

(a)steady state value of the system output✓

(b)initial value of the system output

(c) transient behavior of the system output

(d)none of these

103. . Consider a feedback control system with loop transfer function $(s)H(s) = K(1 + 0.5s)$ /$s(1 + s)(1 + 2s)$ The type of the closed loop system is

(a) zero (b) one✓ (c) two (d) three

104. 2. If the characteristic equation of a closed-loop system is s^2+2s+2 = 0, then the system is

(a) Overdamped (b)Critically damped (c) Under damped✓ (d) undamped

105. A casual system having the transfer function (s) = 1 /$(s$+2) is excited with $10u(t)$. The time at which the output reaches 99% of its steady state value is

(a) 2.7 sec (b)2.5 sec (c) 2.3 sec✓ (d)2.1 sec

106. The open loop transfer function of an unity feedback open loop system $(2s^2$+6s+5)/ $(s$+1)^2 $(s$+2) . The characteristic equation of the closed loop system is

(a) $2s^2 + 6s + 5 = 0$ (b) $(s + 1)^2 (s + 2) = 0$ (c) $2s^2 + 6s + 5 + (s + 1)^2 (s + 2) = 0$✓

(d)$2s^2$+ 6s + 5 − $(s + 1)^2 (s + 2) = 0$

107. The gain margin (in dB) of a system having the loop transfer function (s) H(s) = √2/$s(s + 1)$ is

(a) 0 (b) 3 (c) 6 (d) ∞✓

108. The phase margin (in degrees) of a system having the loop transfer function (s) $H(s)$ = 2√3/ $s(s$ + 1) is

GRAPH

(a) 45^0 (b)-30^0 (c) 60^0 (d) 30^0

109. If the closed – loop transfer function of a control system is given as (s) = (s − 5)/(s + 2)(s + 3) ,then it is

(a) an unstable system (b) an uncontrollable system (c) a minimum phase system✓ (d) a non – minimum phase system

110.Consider a characteristic equation given by s 2 + 3s 3 + 5s 2 + 6s + K + 10 The

condition for stability is

(a) K > 5 (b) – 10 < K (c) K > – 4 (d) – 10 < K < – 4✓

111. A system has fourteen poles and two zeros. Its high frequency asymptote in its magnitude plot having a slope of:

(a) – 40 dB/decade (b)– 240 dB/decade✓ (c) – 280 dB/decade (d)– 320 dB/decade

112. The polar plot of (s) = 10/ s(s+1)^2 intercepts real axis at $\omega = \omega_0$. Then, the real part and ω_0 are respectively given by:

GRAPH

(a) – 2.5, 1 (b) – 5, 0.5 (c) – 5, 1 (d) – 5, 2

113. Non-minimum phase transfer function is defined as the transfer function

(a) which has zero in the right-half s-plane

(b)which has zero only in the left-half s-plane

(c) which has poles in the right-half s-plane✓

(d)which has poles in the left-half s-plane

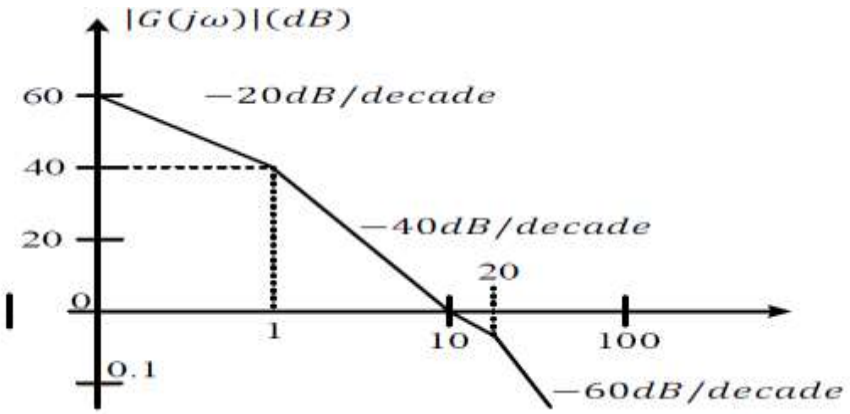
114. A system has poles at 0.01 Hz, 1 Hz and 80 Hz; zero at 5 Hz, 100 Hz and 200 Hz. The approximate phase of the system response at 20 Hz is

(a) – 90^0 ✓ (b) 0^0 (c) 90^0 (d) – 180^0

115. In the Bode – plot of a unity feedback control system, the value of phase of ($j\omega$) at the gain cross over frequency is – 125^0 . The phase margin of the system is

(a) -125^0 (b)-55^0(c) 55^0 ✓ (d)125^0

116. The asymptotic Bode plot of a transfer function is as shown in the figure. The transfer function G(s) corresponding to this Bode plot is



(a) 1 /(s+1)(s+20) (b) 1 /s(s+1)(s+20) (c) 100 /s(s+1)(s+20) (d) 100/ s(s+1)(1+0.05s)✓

117. 8. In a Bode magnitude plot, which one of the following slopes would be exhibited at high frequency by 4th order all-pole system?

(a) – 80 dB/decade✓ (b)– 40 dB/decade (c) + 40 dB/decade (d)+ 80 dB/decade

118.In a close loop systems with positive value of feedback gain the overall gain of the system will

(a) decrease (b) increase✓ (c) be unaffected

119. By which of the following the control action is determined when a man walks in a path?

(a) Brain (b) Hands (c) legs (d) Eyes✓

120. The transfer function of a systems is used to calculate which of the following?

(a) The order of the systems (b) Time Constant (c) The output of any given input✓

(d) The steady state gain.

121. The response of *h(t)* of a linear time invariant system to an impulse δ(t), under initially relaxed condition is $h(t) = e^{-t} + e^{-2t}$. The response of this system for a unit step input *u(t)* is

A. $2u(t) + e^{-t} + e^{-2t}$
B. $(e^{-t} + e^{-2t})u(t)$
C. $(1.5 - e^{-t} + 0.5e^{-2t})u(t)$✓
D. $e^{-t}\delta(t) + e^{-2t}u(t)$

122. A system is described by the following state and output equations

$$\frac{dx_1(t)}{dt} = -3x_1(t) + x_2(t) + 2u(t)$$
$$\frac{dx_2(t)}{dt} = -2x_2(t) + u(t)$$
$$y(t) = x_1(t)$$

where u(t) is the input and y(t) is the output. The system transfer function is

A. $\frac{s+2}{s^2+5s-6}$
B. $\frac{s+3}{s^2+5s+6}$
C. $\frac{2s+5}{s^2+5s+6}$✓
D. $\frac{2s-5}{s^2+5s-6}$

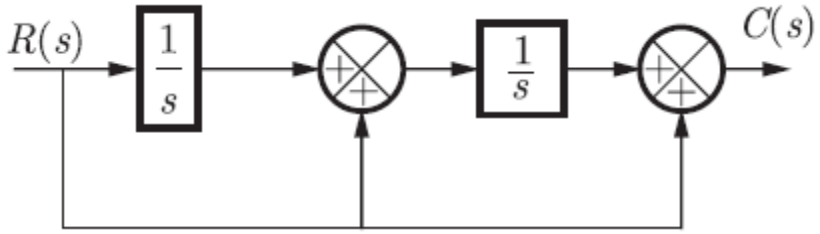
123. A state variable system $\dot{X}(t) = \begin{bmatrix} 0 & 1 \\ 0 & -3 \end{bmatrix} X(t) + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u(t)$ with the initial condition $X(0) = \begin{bmatrix} -1 \\ 3 \end{bmatrix}$ and the unit step input u(t) has the state transition matrix

A. $\begin{bmatrix} 1 & \frac{1}{3}(1 - e^{-3t}) \\ 0 & e^{-3t} \end{bmatrix}$✓
B. $\begin{bmatrix} 1 & \frac{1}{3}(e^{-t} - e^{-3t}) \\ 0 & e^{-t} \end{bmatrix}$

C. $\begin{bmatrix} 1 & \frac{1}{3}(e^{-3t}-e^{-2t}) \\ 0 & e^{-3t} \end{bmatrix}$

D. $\begin{bmatrix} 1 & (1-e^{-t}) \\ 0 & e^{-t} \end{bmatrix}$

124. For the block diagram shown in following figure, the transfer function C(s)/R(s) is equal to



A. $\frac{s^2+1}{s^2}$

B. $\frac{s^2+s+1}{s^2}$ ✓

C. $\frac{s^2+s+1}{s}$

D. $\frac{1}{s^2+s+1}$

125. A control system is defined by the following mathematical relationship

$$\frac{d^2x}{dt^2} + 6\frac{dx}{dt} + 5x = 12(1-e^{-2t})$$

The response of the system as t→∞

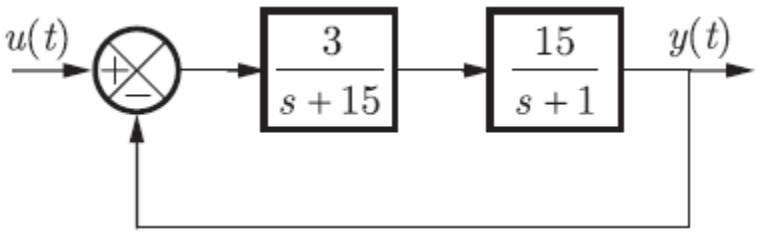
A. *x*=6

B. *x*=2

C. *x*=-5

D. *x*=2.4✓

126. The steady state error of the following unity feedback closed loop system, which is subjected to unit step input is



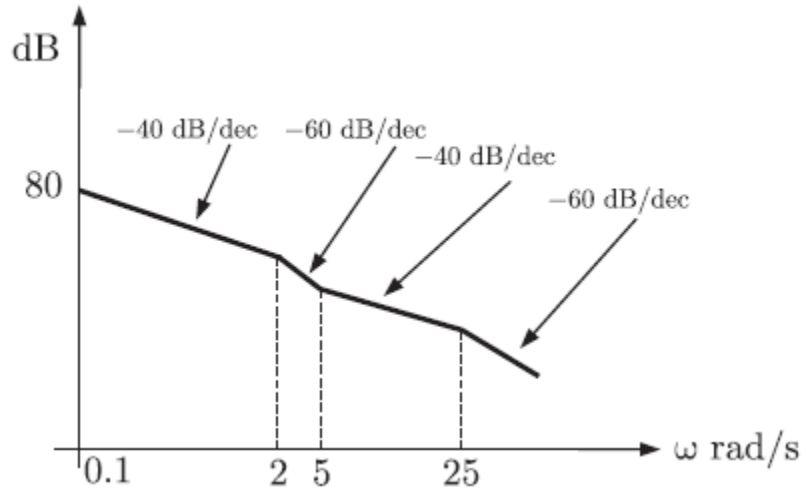
A. 25% ✓

B. 0.75%

C. 6%

D. 33%

127. The asymptotic approximation of the log-magnitude versus frequency plot of a minimum phase system with real poles and one zero is shown in following figure. Its transfer function is



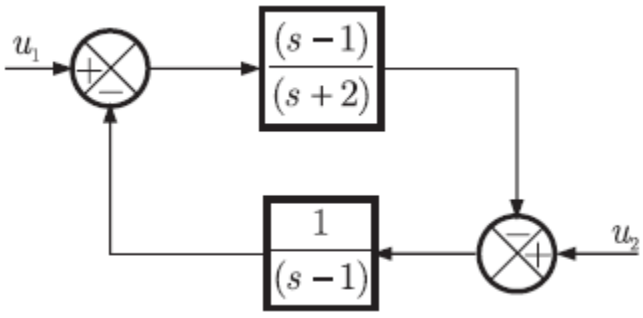
A. $\frac{20(s+5)}{s(s+2)(s+25)}$

B. $\frac{10(s+5)}{(s+2)^2(s+25)}$

C. $\frac{20(s+5)}{s^2(s+2)(s+25)}$ ✓

D. $\frac{50(s+5)}{s^2(s+2)(s+25)}$

128. The system shown in following figure is



A. Stable
B. Unstable
C. Conditionally stable
D. Stable for input u_1, but unstable for input u_2 ✓

129. The gain margin of a unity feedback control system with the open loop transfer function $G(s) = \frac{(s+1)}{s^2}$ is

A. 0✓

B. $\frac{1}{\sqrt{2}}$

C. $\sqrt{2}$

D. ∞

130. For the system $\dot{X} = \begin{bmatrix} 2 & 3 \\ 0 & 5 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$, which of the following statement is true?

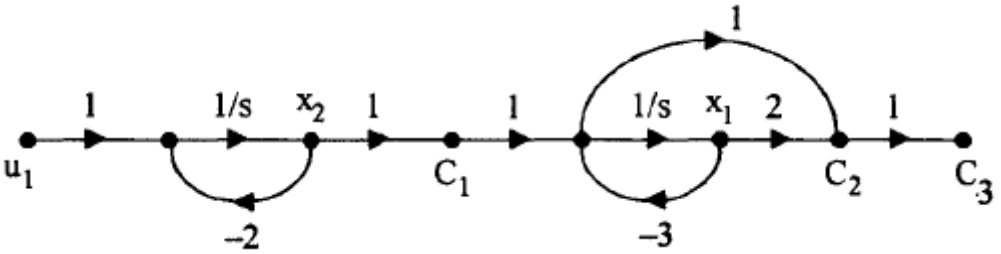
A. The system is controllable but unstable

B. The system is uncontrollable and unstable✓

C. The system is controllable and stable

D. The system is uncontrollable but stable

131. The state diagram of a system is shown in following figure.



The system is

A. Controllable and observable✓

B. Controllable but not observable

C. Observable but not controllable

D. Neither controllable nor observable

132. The transfer function of a lead compensator is $G_c(s) = \frac{1+0.12s}{1+0.04s}$. The maximum phase shift than can be obtained from this compensator is

A. 60^0

B. 45^0

C. 30^0 ✓

D. 15^0

133. The dynamics of the system governed by a set of equations is

$$\dot{x}_1 = 2x_1 + x_2 + u$$
$$\dot{x}_2 = -2x_1 + u$$
$$y = 3x_1$$

The transfer function Y(s)/U(s) is given by

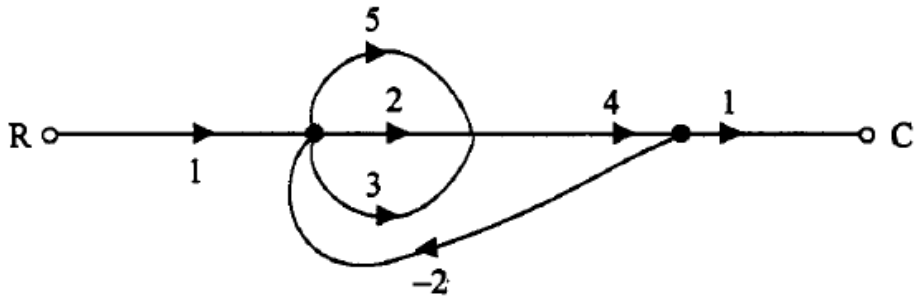
A. $3(2s+1)/s^2-2s+2$

B. $3(2s+1)/s^2-2s+1$

C. $(s+1)/s^2-2s+1$

D. $3(s+1)/s^2-2s+2$✓

134. In the signal flow graph shown in figure, the ratio of C/R is

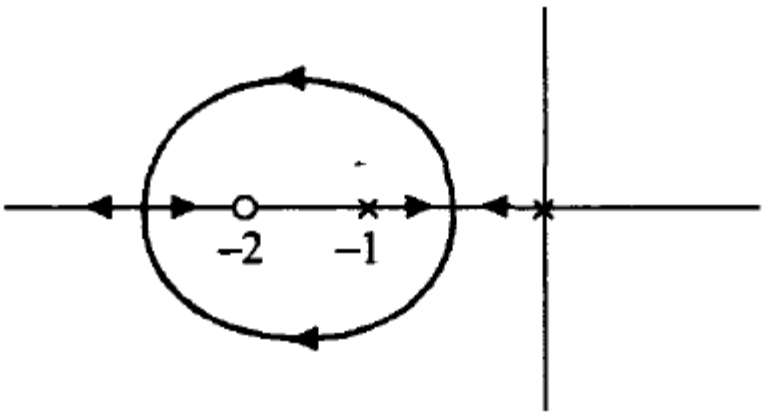


A. 28/57
B. 40/57
C. 40/81✓
D. 28/81

135. The open loop transfer function of a system is given by $G(s) = \frac{K}{s(s+2)(s+4)}$. The maximum value of K for which the unity feedback system will be stable is

A. 64
B. 48✓
C. 32
D. 16

136. The root locus plot of a unit feedback system is shown in following figure.



The open loop transfer function is

A. $\frac{K}{s(s+1)(s+2)}$

B. $\frac{K(s+1)}{s(s+2)}$

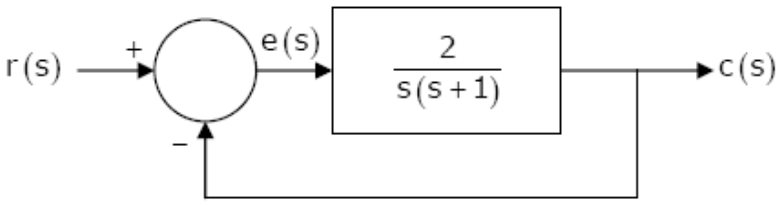
C. $\frac{K(s+2)}{s(s+1)}$✓

D. $\frac{Ks}{(s+1)(s+2)}$

137. The impulse response of a system $G(s) = \frac{2}{(s+1)(s+3)}$ is

A. $e^{-t} - e^{-3t}$✓ B. $e^{-2t} - e^{-3t}$ C. $2e^{-2t} - e^{-3t}$ D. $e^{-t} + e^{-3t}$

138. A unit ramp input is applied to the system shown in the adjoining figure. The steady state error in its output is



(A) 0 (B) 0.5 ✓ (C) 1 (D) 2

139. The open loop transfer function of a unity feedback control system is $10/ (s+5)^3$. The gain margin of the system will be

A. 20 dB B. 40 dB✓ C. 60 dB D. 80 dB

140. The unit impulse response of a linear time invariant second order system is

$$y(t) = 10e^{-8t} \sin 6t \; (t \geq 0)$$

The natural frequency and damping ratio of the system are

A. 10 rad/s and 0.6
B. 5 rad/s and 0.6
C. 5 rad/s and 0.8
D. 10 rad/s and 0.8✓

141. The number of roots of $s^3 + 5s^2 + 7s + 3 = 0$ in the left half of the s – plane is

A. Zero B. One C. Two D.Three✓

142. If $s^3 + 3s^2 + 4s + X = 0$, then all the roots of this equation are in the left half plane provided that

A. $X > 12$ B. $-3 < X < 4$ C. $0 < X < 12$✓ D. $5 < X < 12$

143. Consider a characteristic equation given by $s^2 + 3s^3 + 5s^2 + 6s + K + 10$

The condition for stability is

A. $K > 5$ B. $-10 < K$ C. $K > -4$ ✓ D. $-10 < K < -4$

144. The characteristic polynomial of system is $q(s) = 2s^5 + s^4 + 4s^3 + 2s^2 + 2s + 1$. The system is

A. stable B. marginally stable C. unstable✓ D. oscillatory

145. The unit impulse response of a linear time invariant system is the unit step function u(t).

For $t > 0$, the response of the system to an excitation $e^{-}(t)$, $a > 0$ will be

A. ae^{-at} B. $(1/a)(1 - e^{-at})$ ✓ C. $a(1 - e^{-at})$ D. $1 - e^{-at}$

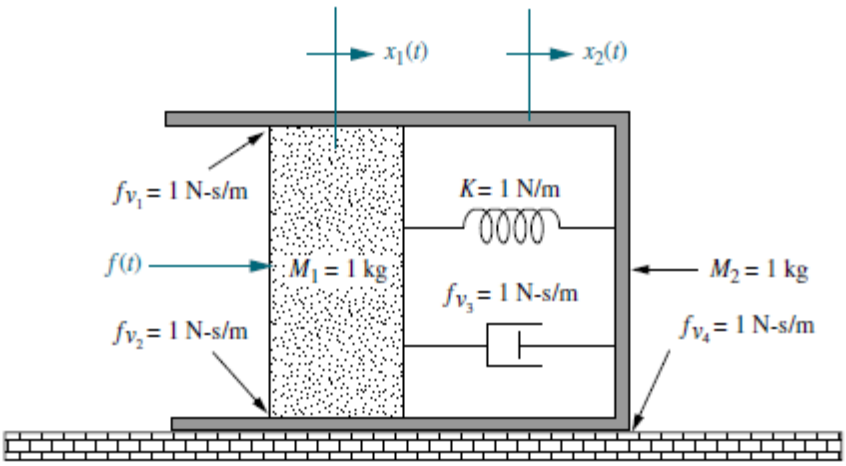
146. For a second order system, damping ratio (ξ), is $0 < \xi < 1$, then the roots of the characteristic polynomial are

A. real but not equal B. real and equal C. complex conjugates✓ D. imaginary

147. If the characteristic equation of a closed-loop system is $s^2 + 2s + 2 = 0$, then the system is

A. Overdamped B.Critically damped C. Under damped✓ D.undamped

148. In the figure below the number of forces opposing motion on mass M2 is



A. Three B. Four C. Five D. Six✓

149. The phase angle of the following transfer function $G(s) = \frac{20}{S(1+3S)(1+4S)}$ is given by:

A. $90° - \tan^{-1} 3\omega - \tan^{-1} 4\omega$
B. $-90° - \tan^{-1} 3\omega - \tan^{-1} 4\omega$ ✓
C. $-90° + \tan^{-1} 3\omega + \tan^{-1} 4\omega$
D. $90° + \tan^{-1} 3\omega + \tan^{-1} 4\omega$

150. The corner frequencies for the following transfer function $G(s) = \frac{10}{S(1+0.4S)(1+0.1S)}$ are

A. 0.4 and 0.1 B. 4 & 1 C. 2.5 & 10✓ D. 4 & 10