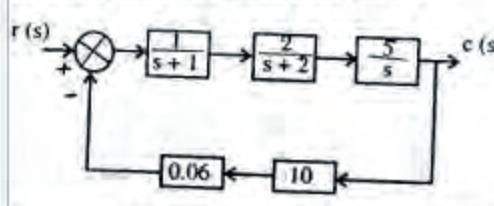


ELECTRICAL ENGINEERING

1. The open-loop transfer function of the control system shown in the figure is



- a. $\frac{10}{s(s+1)(s+2)}$
- b. 0.6
- c. $\frac{6}{s(s+1)(s+2)}$
- d. $\frac{10}{s^3 + 3s^2 + 2s + 6}$

2. If the single flow graph shown in the given figure has M number of forward paths and P number of individual loops, then



- a. M = 6, P = 6
- b. M = 6, P = 4
- c. M = 4, P = 6
- d. M = 4, P = 4

3. The impulse response of a system is given by $c(t) = \frac{1}{2}e^{-t/2}$. Which one of the following is its unit step response?

- a. $1 - e^{-t/2}$
- b. $1 - e^{-t}$
- c. e^{-t}
- d. $1 - e^{-t}$

4. If the open-loop transfer function of a feedback system is given by

$$G(s)H(s) = \frac{K}{s(s+2)(s^2 + 2s + 5)} \quad \text{the}$$

- centroid of the asymptotes will be
- a. -1, 0
 - b. 1, 0
 - c. 0, -1
 - d. 0, 1

5. The first element of each of the rows of a Routh-Hurwitz stability test showed the sign as follows:

Rows	I	II	III	IV	V	VI	VIII
Sings	+	-	+	+	+	-	+

The number of roots of the system lying in the right half of s plane is

- a. 2
- b. 3
- c. 4
- d. 5

6. The performance specifications for unity feed control system having an open-loop transfer function

$$G(s) = \frac{1}{s(s+1)(s+2)}$$

- are V_o > 10 sec⁻¹ error coefficient

stable closed-loop operation

The value of K, satisfying the above specification is

- a. K > 6
- b. 6 < K < 10
- c. K > 10
- d. None of the above

7. The effect of phase-lead compensator on gain cross-over frequency W_{cg} and the bandwidth W_b is that

- a. Both increase
- b. Both decrease
- c. W_{cg} increase while W_b decrease
- d. W_{cg} decreases while W_b increases

8. A linear 2nd order single input continuous time system is described by the following set of differential equations:

$$X_1 = 2X_1 + 4X_2$$

$$X_2 = 2X_1 - X_2 - u(t)$$

Where X_1 and X_2 are state variables and $u(t)$ is the input. The system is

- a. Controllable and stable
- b. Controllable but unstable
- c. Uncontrollable and unstable
- d. Uncontrollable but stable

9. For

$$\phi(s) = \begin{bmatrix} \frac{s+6}{s^2+6s+5} & \frac{1}{s^2+6s+5} \\ -5 & s \\ \frac{-s}{s^2+6s+5} & \frac{s}{s^2+6s+5} \end{bmatrix}$$

The coefficient matrix A is

- a. $\begin{bmatrix} 6 & -5 \\ -6 & 0 \end{bmatrix}$
- b. $\begin{bmatrix} 5 & -5 \\ 0 & -6 \end{bmatrix}$
- c. $\begin{bmatrix} 6 & 0 \\ -5 & -6 \end{bmatrix}$
- d. $\begin{bmatrix} 0 & 1 \\ -5 & -6 \end{bmatrix}$

10. Which of the following quantities are analogous in a force-current analogy?

1. Displacement and inductance
2. Velocity and voltage
3. Mass and capacitance

Select the correct answer using the codes given below:

- a. 1,2 and 3
- b. 1 and 2
- c. 2 and 3
- d. 1 and 3

11. If R and X are the resistance and inductance respectively D and L are the diameter and length respectively of the rotor of a three phase ac servomotor, then the ratio D/X and X/R will be respectively

- a. Large and large
- b. Large and small
- c. Small and large
- d. Small and small

12. In the case of an armature controlled dc motor, if the equivalent moment of inertia of the motor and load is made small and the armature resistance is reduced, then the motor tends to act like armature resistance is reduced, then the motor tends to act like

- a. A differentiating circuit
- b. An integrating circuit
- c. A PID controller
- d. A second order critically damped system

13. To detect the error between a reference shaft position and an output shaft position which of the following error detectors can be used?

1. A pair of tachogenerators
2. A pair of potentiometer
3. A synchrony pair

Select the correct answer using the codes given below:

- a. 1,2 and 3
- b. 1 and 2
- c. 2 and 3
- d. 1 and 3

14. When 30V dc is applied to the vertical deflecting plates of a cathode ray tube, the bright spot moves 1cm away from the centre. If 30V (rms) ac is applied, then the movement of the spot will be nearly

- a. 1 cm
- b. 1.5 cm
- c. 2 cm
- d. 3 cm

15. A spectrum analyzer can be described as

- a. Voltage selective frequency meter
- b. Current selective frequency meter
- c. Frequency selective voltmeter
- d. Ammeter

16. Let $\frac{dM}{d\theta}$ be the rate of change of mutual inductance between the fixed and moving coil with respect to the angular deflection θ in an electrodynamics spring controlled ammeter. Which one of the following is the correct condition for obtaining a linear scale in the ammeter?

- a. $\theta \frac{dM}{d\theta}$ is constant
- b. $\frac{1}{\theta} \frac{dM}{d\theta}$ is constant
- c. $\theta^2 \frac{dM}{d\theta}$ is constant
- d. $\frac{1}{\theta^2} \frac{dM}{d\theta}$ is constant

17. A current $[1 + \sqrt{2} \sin(314t - 30^\circ) + 2 \sin(1570t + 20^\circ)]$ amperes is measured with a thermocouple type ammeter. The meter will read

- a. 2A
- b. $\sqrt{2}A$
- c. $(3 + \sqrt{2})A$
- d. 4A

18. A thermocouple produces a voltage of 50mV. Its internal resistance is 10Ω . The output is read by a PMMC meter having an internal resistance of 120Ω . Output voltage indicated will be

- a. 50mV
- b. 40mV

- c. 33.3mV
d. 25.0mV

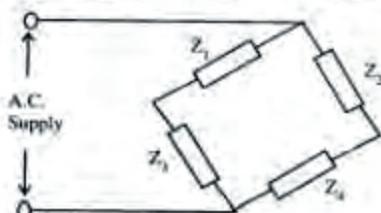
19. The three impedances of an ac bridge shown below are

$$Z_1 = 200 \angle 60^\circ \Omega$$

$$Z_2 = 400 \angle -90^\circ \Omega$$

$$Z_3 = 300 \angle 0^\circ \Omega$$

The value of Z_4 for the balanced bridge is



- a. $150 \angle 150^\circ \Omega$
b. $150 \angle -30^\circ \Omega$
c. $600 \angle -30^\circ \Omega$
d. $600 \angle -150^\circ \Omega$

20. Match List I (Type of instrument) with List II (Suitability for measurement) and select the correct answer using the codes given below the lists.

List I

- A. Moving iron
B. Electrodynamics
C. Induction
D. Electrostatic

List II

1. ac/dc voltage only
2. ac/dc voltage/current power only
3. ac voltage/current/ power
4. ac/dc voltage/current power
5. dc voltage/ current correct

	A	B	C	D
a.	2	1	3	1
b.	3	1	1	3
c.	1	2	3	5
d.	4	2	5	3

21. In a Wheatstone bridge, the known resistances are correct to within $\pm 0.1\%$. The accuracy to which an unknown resistance can be measured is

- a. 0.4%
b. 0.3%
c. 0.2%
d. 0.1%

22. Match List I (unit) with List II (Equivalent unit) and select the correct answer using the codes given below the lists.

List I

- A. Weber

- B. Coulomb

- C. Farad

List II

1. Ampere-second per volt
2. Volt-second
3. Ampere-second
4. Volt per second

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

23. A special purpose diode which uses metals like gold, silver or platinum on one side of the junction, n-type doped silicon on another side and has almost no charge storage in the junction, is a

- a. Schottky diode
b. Tunnel diode
c. Varactor diode
d. Zener diode

24. Consider the following statements

1. JFET needs bias stabilization because its I_D increase with increase in V_{BE} and temperature.
2. Thermal runaway may be avoided by choosing $V_{CP} < 1/2 V_{CE}$.
3. FET and BJT both need bias stabilization because both are semiconductor devices.
4. By increasing R_F , bias stabilization improves.

Of these statements

- a. 1 and 2 are correct
b. 3 and 4 are correct
c. 2 and 3 are correct
d. 2 and 4 correct

25. The overall voltage gain in a small single transistor CE amplifier is given by

a. $A_V = \frac{h_{fe} R_L}{h_{ie} + R_L}$

b. $A_V = \frac{-h_{fe} R_L}{h_{ie} + R_L}$

c. $A_V = \frac{h_{fe} R_L}{h_{ie} + R_L / R_L}$

d. $A_V = \frac{-h_{fe} R_L}{h_{ie} + R_L / R_L}$

26. A feedback amplifier has a closed-loop gain of -200. It should not vary more than 50%, despite 25% variation in amplifier gain A without feedback. The value of A is

- a. 800
b. -800
c. 1000
d. -1000
27. Match List I (Device) with List II (Property) and select the correct answer using the codes given below the lists:
- List I**
- Planar monolithic BJT
 - Thick film
 - Thin film
 - Opt coupler
- List II**
- Low-cost resistors
 - Resistors suitable for high frequency use
 - Isolator
 - High frequency transistors
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 2 | 3 | 1 | 4 |
| b. | 4 | 1 | 2 | 3 |
| c. | 4 | 1 | 3 | 2 |
| d. | 2 | 3 | 4 | 1 |
28. Assuming that only the X and Y logic inputs are available and their complements \bar{X} and \bar{Y} are not available, what is the minimum number of two-input NAND gates required to implement $X \oplus Y$?
29. In 8085 microprocessor, HL register pair is used for storing
- Address of memory
 - Data
 - Address of next instruction
 - Current instruction
30. The RMS thermal noise voltages of three resistors individually are E_1 , E_2 and E_3 . If these resistors are connected in series, the total noise voltage is given by
- $E_1 + E_2 + E_3$
 - $(\sqrt{E_1^2 + E_2^2 + E_3^2})^2$
 - $\sqrt{(E_1^2 + E_2^2 + E_3^2)}$
 - $(E_1 E_2 E_3)^{1/3}$
31. For three links in tandem, each of the first two has S/N ratio of 60dB while the third has the same 40dB. The overall S/N ratio (approx) is
- 30dB
 - 40dB
 - 50dB
 - 60dB
32. A 10MHz carrier of peak value 10V is amplitude modulated by a 10kHz sine of amplitude 6V. The amplitude of each side band frequency is
- 3V
 - 4V
 - 5V
 - 6V
33. Consider the following statements:
Delta Modulation has some significant advantages over PCM as
- It provides greater channel capacity for a given bit-rate
 - It does not inherently require synchronization
 - It is more tolerant to system noises
- Of these statements
- 1,2 and 3 are correct
 - 1 and 2 are correct
 - 2 and 3 are correct
 - 1 and 3 are correct
34. Consider the following statements:
Equipment is available to enable carrying more than one voice channel on
- A pair of wires
 - A coaxial cable
 - A radio link
 - An optic fiber
- Of these statements:
- 1,2 and 3 are correct
 - 2,3 and 4 are correct
 - 1 and 4 are correct
 - 1,2,3 and 4 are correct
35. Consider the following statements regarding noise in pulse communication systems:
- Those forms of pulse modulation which transmit constant amplitude singles can be made to have good single-to-noise ratio.
 - For PWM and PPM, improved single-to-noise requires higher bandwidth.
 - In PCM, quantizing noise goes up if the number of standard levels is increased.
- Of these statements
- 1 and 2 are correct
 - 1 and 3 are correct
 - 2 and 3 are correct
 - 1,2 and 3 are correct
36. Control of data flow within networks to ensure maximum efficiency and minimum interference between users, is achieved
- Through the isolation of users

- b. Through magic-T networks
 c. By address coding
 d. By using system protocol
37. consider the following statements:
 The advantages of KU band for satellite communication are that
 1. Heavy rainfall does not attenuate the signal
 2. Frequencies are not shared with terrestrial microwave radio system.
 3. It has wide footprint
 4. It has smaller antennas.
 Of these statements
 a. 3 and 4 are correct
 b. 1 and 4 are correct
 c. 2 and 4 are correct
 d. 1,3 and 4 are correct
38. Match List I (Data comm. schemes) with List II (Applications) and select the correct answer using the codes given below the lists:
- List I**
- A. Parallel synchronous
 - B. Parallel asynchronous
 - C. Serial synchronous
 - D. Serial asynchronous
- List II**
- 1. Computer to computer
 - 2. Computer to printer
 - 3. Buses within computer
 - 4. Telephone central office intercommunication
 - 5. Short distance data communication
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 1 | 2 | | |
| b. | 5 | 3 | 2 | 4 |
| c. | 5 | 3 | 4 | 2 |
| d. | 1 | 2 | 5 | 3 |
39. The autocorrelation function of a rectangular pulse of duration T is
 a. Another rectangular pulse of duration T^2
 b. Another rectangular pulse of duration $2T$
 c. A triangular pulse of duration T
 d. A triangular pulse of duration $2T$
40. The ISDN basic rate interface specified as per CCITT standards is
 a. One B channel (64kbps) and one D channel (16kbps)
 b. Two B channels (64kbps)
 c. Two B channels (64kbps) and one D channel (16 kbps)
41. Which of the following circuits need to be checked to rectify a colour TV receiver showing no colour, monochrome picture and normal sound?
 1. Colour killer
 2. 3.58 sub-carrier oscillator
 3. Chrome amplifier
 4. Brightness control
- Select the correct answer using the codes given below:
- Codes:**
- a. 1 and 2
 - b. 1,2 and 3
 - c. 1,3 and 4
 - d. 2,3 and 4
42. A disadvantage of CW Doppler radar is that
 a. It does not give the target position
 b. It does not give the target velocity
 c. It requires a transponder at the target
 d. It does not give the target range
43. In a decca chain of Decca navigation system, for a sub harmonic frequency 'f' what is the frequency of the master station?
 a. $8f$
 b. $5f$
 c. $6f$
 d. $7f$
44. In microwave communication, the antennas of one repeater must be accurately aligned with the next repeater in the link, because
 a. There are at least four carriers with 600-2700 channels per carrier
 b. A repeater must amplify the signal received
 c. The antenna beam widths are less than 2°
 d. The antennas are small in size
45. A dc shunt generator is running at rated speed developing its rated voltage. Match List I (Condition of operation) with List II (Effect) and select the correct answer using the codes given below the lists:
- List I**
- A. The direction of rotation, residual magnetism and field connections are reversed
 - B. The direction of residual magnetism and field connections are reversed

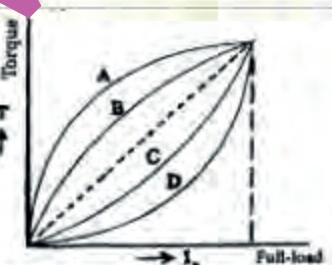
- C. The direction of rotation and connection of the field winding are reversed
 D. The direction of rotation and residual magnetism are reversed

List II

1. The generator will build up with same polarity
2. The generator will build up with reversed polarity
3. The generator will not build up

A	B	C	D
a.	1	2	3
b.	5	3	2
c.	5	3	4
d.	1	2	5

46. In a dc machine, the armature mmf is
- a. Rectangular and directed along the inter-polar axis
 - b. Triangular and directed along the inter-polar axis
 - c. Triangular and directed along the brush axis
 - d. Rectangular and directed along the brush axis
47. A shunt motor is running at its rated speed on rated load. If the field circuit fets suddenly opened.
- a. Torque developed by the motor will be almost zero and the motor will stop without causing any damage to the motor
 - b. The motor will draw very high armature current but it will continue to drive the load at a reduced speed
 - c. The motor would tend to race to a high speed while driving the load
 - d. The motor would draw very high armature current and will stall with consequent damage to the armature
48. The torque vs armature current characteristics (A,B,C and D) of different types of motor are shown in the given diagram.



Match the curves A,B,C and D with the dc motors given in List I and select the codes given below the list:

List I

1. Shunt
2. Cumulative compound
3. Series
4. Differential compound

A	B	C	D
a.	4	2	1
b.	4	1	2
c.	3	1	2
d.	3	2	1

49. When starting a differentially connected compound motor it is desirable to short-circuit the series field winding to
- a. Avoid very high starting time
 - b. Avoid excessive starting speed
 - c. Prevent the motor from starting in the reverse direction
 - d. Avoid heavy in-rush of current
50. For a uniformly distributed winding of an alternator with a phase spread of β degrees, the distribution factor is
- a. $\frac{\sin \beta}{\beta}$
 - b. $\frac{2 \sin \beta / 2}{\beta}$
 - c. $\frac{\sin \beta / 2}{\beta}$
 - d. $\frac{\sin \beta / 2}{2\beta}$
51. A single-phase alternator has a synchronous reactance of 2 ohms and negligible resistance. If supplies 10A to a purely capacitive load at 200V, then the generated emf will be
- a. 240 volts
 - b. 220 volts
 - c. 200 volts
 - d. 180 volts
52. Suppose a synchronous generator connected to an infinite bus is supplying electrical power at unity PF to the bus. If its field correct is now increased.
- a. Both the active and reactive power output of the generator will remain unchanged
 - b. The active power supplied will remain unchanged but the machine will also supply lagging reactive power
 - c. The active power supplied will increase and the machine will draw leading reactive power

- d. The active power supplied will decrease and the machine will supply leading reactive power
53. In the phasor-diagram of a round-rotor synchronous generator the voltage equation is $\bar{E}_t = \bar{V}_t + I_a (r_a + jX_s)$, where \bar{E}_t = excitation voltage, \bar{V}_t = terminal voltage; I_a = armature current at lagging power factor r_a = armature resistance; X_s = synchronous reactance. While remaining synchronized to the bus-bars (infinite bus), if the power input from the prime mover is gradually decreased and finally stopped, it will result in
- Reversal of I_a and E_t lagging V_t
 - Reversal of I_a , but E_t leading V_t
 - The sign of I_a remaining unchanged, but E_t leading V_t
 - The sign of I_a remaining unchanged, but E_t lagging V_t
54. A 3-phase induction motor has a full-load slip of 3 percent at normal voltage. Which one of the following will be the value of the slip of the motor if it develops the same torque theoretically while operating at 110 per cent of its normal voltage?
- 2.48%
 - 0.248%
 - 0.483%
 - 4.83%
55. A 6-pole, 3-phase, 60Hz induction motor runs at 1000 rpm developing maximum torque. Rotor resistance per phase is 1.2 ohms. Neglecting stator impedance, then for developing maximum torque, the external resistance to be connected in series with each rotor phase will be
- 7.2 ohms
 - 6 ohms
 - 14 ohms
 - 1.2 ohms
56. The capacitor-start single-phase induction motor develops much larger starting torque in comparison with the "split-phase" motor, because the use of capacitors in the auxiliary winding enables
- Provision of larger number of turns in the auxiliary winding
 - A larger starting current to be drawn from the supply
 - The torque-slip characteristic in general to get a shape to give a large starting torque
57. d. The current division between the main and auxiliary windings to be conducive for the development of large starting torque
- If the load of a synchronous motor is increased while keeping the field excitation constant, then
- Power factor will increase and power angle will decrease
 - Power factor will decrease and power angle will increase
 - Both power factor and power angle will increase
 - Both power factor and power angle will decrease
58. A synchronous motor operates as a synchronous condenser when it is
- Operated at unity power factor
 - Under excited
 - Over excited
 - Connected in parallel with condensers
59. An equipment has 0.8 per unit impedance on base on 66KV, 100MVA. Its per unit impedance on a base of 33KV, 100MVA will be
- 0.4
 - 0.8
 - 1.6
 - 3.2
60. In a 3-phase power transformer, 5-timbed construction is adopted to
- Suppress the 5th and 7th harmonics
 - Suppress the 3rd and its multiple harmonics
 - Suppress all the orders of harmonics
 - Increase the capacity of the transformer
61. A transformer has a resistance of 2% and reactance of 4%. Its regulations at 0.8 power factor lagging a leading respectively are
- 4 percent and -0.8 percent
 - 4 percent and 0.8 per cent
 - 0.8 percent and 4 percent
 - 0.8 percent and -4 percent
62. Consider the following statements:
- The use of Delta-connected tertiary windings in star-star connected power transformers
- Makes available supply for single-phase loads.
 - Suppresses harmonic voltages.
 - Allows flow of earth fault current for operation of protective devices.

4. Provides low-reactance paths for zero-sequence currents.

Of these statements:

- 1,2 and 3 are correct
- 1,3 and 4 are correct
- 2 and 4 are correct
- 1,2,3 and 4 are correct

63. If $\frac{dv}{dt}$ occurring across a thyristor exceeds its permissible value then the thyristor will
- Remain in the forward blocking state without any damage
 - Turn off to get damaged
 - Turn on but whether it gets damaged or not will depend on the final follow up currents
 - Not turn off but get damaged

64. Which one of the following is necessary for a triggering system for thyristors in a line commentator converter?
- It must use separate power supply
 - It should provide a train of pulses
 - It should be synchronized with the mains supply providing a single pulse of suitable value
 - It should be synchronized with mains providing a train of pulses

65. The average load current of a dc chopper feeding a pure resistive load is I_{avg} . If a variable inductance connected in the load circuit is progressively increased from zero value, keeping the duty ratio unchanged, then the average load current will
- Increase starting from I_{avg}
 - Decrease with a starting value of I_{avg}
 - Remain the same at I_{avg}
 - Increase to some highest value of current and then decrease again to I_{avg}

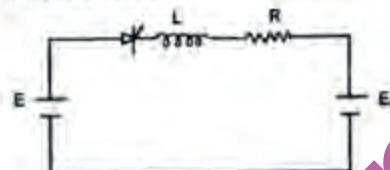
66. Consider the following statements:
The source impedance of an ac to dc line commutated phase controlled converter

- Causes $\frac{dv}{dt}$ compatibility of thyristors.
- Causes a voltage drop in the dc terminal voltage.
- Improves the line side power factor.
- Limits the range of firing angles.
- Reduced the line side power factor.

Of these statements:

- 1,3 and 4 are correct
- 1,2 and 4 are correct
- 2 and 5 are correct
- 2,4 and 5 are correct

67. In the chopper circuit given below, $E=220$ V, $L=1\text{mH}$, $R = 0.25\Omega$, $E_L = 22\text{V}$, $T = 2500\mu\text{sec}$, $T_{on} = 1000\mu\text{sec}$. The value of T_{off} for which the current becomes discontinuous is



- $332.5\mu\text{sec}$
- $33.25\mu\text{sec}$
- $665\mu\text{sec}$
- $66.5\mu\text{sec}$

68. A single-phase voltage controller is employed for controlling the power flow from $260\text{V}, 50\text{Hz}$ source into a load consisting of $R = 5\Omega$ and $\omega L = 12\Omega$. The values of maximum rms load current and the firing angle are respectively
- $\frac{260}{10.9}A$ and 0°
 - 20A and 0°
 - 20A and 90°
 - $\frac{260}{10.9}A$ and 90°

69. In sinusoidal PWM, there are m cycles of the triangular carrier wave, in the half cycle of reference sinusoidal single. If the zero of the reference sinusoid coincides with the zero of the triangular carrier wave, then the number of pulses generated in each half cycle is
- $m/(m-1)$
 - $(m+1)/(m-1)$
 - 1
 - $(m-1)/m$

70. The number of thyristors required for single phase to single phase cycloconverter of the mid-point type and for three phase phase to three-phase 3-pulse type cycloconverter are respectively
- 4 and 6
 - 4 and 4
 - 4 and 18
 - None of the above

71. Match List I (Drive) with List II (Speed control range) and select the correct answer using the codes given below the lists:

List I

- a. Square wave inverter-fed induction motor
- b. PWM inverter-fed induction motor
- c. Slip energy recovery scheme with cycloconverter in the rotor circuit
- d. Cycloconverterfed induction motor

List II

1. 50% of synchronous speed to synchronous speed
2. 10% of base speed to beyond base speed (1:20)
3. 0 to 1/3 base speed
4. 67% of synchronous speed to 133% of synchronous speed zero to 150% of base speed (1:infinity)

Codes:

	A	B	C	D
a.	2	5	4	3
b.	2	5	3	4
c.	3	2	4	1
d.	3	2	1	4

72. In which one of the following models of transmission lines, is the full charging current assumed to flow over half the length of the line only?
- a. Equivalent- π
 - b. Short line
 - c. Nominal - π
 - d. Nominal - T
73. If the receiving-end voltage and current are numerically equal to the corresponding sending-end values, that is $|V_R|=|V_S|$ and $|I_R|=|I_S|$, then such a line is called
- a. An infinite line
 - b. A natural line
 - c. A tuned line
 - d. A loss-less line
74. The convergence characteristics of the Newton-Raphson method for solving a load flow problem is
- a. Radialic
 - b. Linear
 - c. Geometric
 - d. Cubic
75. If $|V_R|=|V_S| = 66kV$ for three -phase transmission and reactance is 11 ohms/phase, then the maximum power transmission per phase would be
- a. 132MW
 - b. 396MW
 - c. 66MW
 - d. None of above
76. For a two-machine system with losses, with the transfer impedance being

resistive, the maximum value of the sending end power $P_{1\max}$ and the maximum receiving -end power $P_{2\max}$ will occur at power angle (δ) in such a manner that

- a. Both $P_{1\max}$ and $P_{2\max}$ occur at $\delta < 90^\circ$
- b. Both $P_{1\max}$ and $P_{2\max}$ occur at $\delta > 90^\circ$
- c. $P_{1\max}$ occur at $\delta > 90^\circ$ and $P_{2\max}$ at $\delta < 90^\circ$
- d. $P_{1\max}$ occur at $\delta < 90^\circ$ and $P_{2\max}$ at $\delta > 90^\circ$

77. Consider the following expression:

$$V = f_1(x - vt) + f_2(x + vt)$$

Where f_1 and f_2 represent two traveling waves on a transmission line. In this case

- a. Both waves travels in the positive direction of x
- b. Both waves travel in the negative direction of x
- c. Wave f_1 travels in the positive direction of x but wave f_2 travels in the negative direction of x
- d. For reducing tower foot in resistance, it is better to employ
 - a. Chemical and counterpoise
 - b. Chemical and ground rods
 - c. Ground rods and counterpoise
 - d. Chemical, ground rods and counterpoise

78. A suspension type insulator has three units with self-capacitance C and ground capacitance of 0.2 C having a string efficiency of

- a. 78%
- b. 80%
- c. 82%
- d. 84%

79. A bulled conductor line compared to a single conductor line (With same conductor cross-sectional area and same meant distance between conductors) has

Self GMD	Mutual GMD	Per phase inductance
a. Lower	Nearly same	Higher
b. Higher	Lower	Nearly same
c. Higher	Nearly same	Lower
d. Lower	Higher	Higher

80. In a 14-bus power system network, there are 5 voltage controlled buses. The size of the jacobian matrix useful for power flow analysis will be

- a. 16×16
- b. 23×23

- c. 21×21
d. 8×8
82. A thyrite lighting arrester has
 a. Inverse resistance characteristics
 b. A gap
 c. Efficient earthing
 d. A combination of inverse resistance characteristics and gap
83. Differential protection of a generator makes use of the principal that under normal conditions, the current/currents
 a. At the neutral end of a phase winding is zero
 b. In each of the phase winding is identical
 c. At both ends of the phase winding are equal
 d. At the two ends of the phase winding are unequal the reactance relay is essentially
84. The reactance relay is essentially
 a. An over-voltage relay with current restraint
 b. An over-current relay with directionally restraint
 c. A directional relay with voltage restraint
 d. A directional relay with current restraint
85. Severe over-voltages are produced during arcing faults in a power system with the neutral
 a. Isolated
 b. Solidly Earthed
 c. Earthed through a low resistance
 d. Earthed through an inductive coil
86. In HVDC transmission system, rectifier firing angle is kept near
 a. 0°
 b. 15°
 c. 45°
 d. 90°
87. A bus system is shown in the given figure. When 100 MW is transmitted from Plant 1 to the load, the transmission loss is 10MW. The incremental fuel costs of the two plants are $\frac{dc_1}{dP_1} = 0.02P_1 + 16$ and $\frac{dc_2}{dP_2} = 0.04P_2 + 20$.

The optimum distribution of total load of 260 MW between the two plants when losses are included but not coordinated is



- | | |
|----------|-------|
| P_1 | P_2 |
| a. 300MW | 50MW |
| b. 240MW | 20MW |
| c. 130MW | 130MW |
| d. 220MW | 60MW |

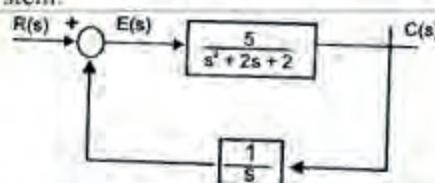
88. Assertion (A): The system with transfer function

$$G(s) = \frac{10(s-12)}{s(s+2)(s+5)}$$

Reason (R): It has a zero in the right half of the s-plane.

- a. Both A and R are true and R is the correct explanation of A
 b. Both A and R are true but R is not a correct explanation
 c. A is true but R is false
 d. A is false but R is true

Assertion (A): The closed-loop system represented in the given figure is a type -1 system.



Reason (R): Number of poles at the origin possessed by the feedback path decides the type of the closed-loop system.

- a. Both A and R are true and R is the correct explanation of A
 b. Both A and R are true but R is not a correct explanation
 c. A is true but R is false
 d. A is false but R is true

Assertion (A): Data acquisition systems are widely used in a variety industrial and scientific areas.

Reason (R): Data acquisition systems often use magnetic tape recorders.

- a. Both A and R are true and R is the correct explanation of A
 b. Both A and R are true but R is not a correct explanation
 c. A is true but R is false
 d. A is false but R is true

Assertion (A): In fibre optic communication, the $1.3 \mu\text{m}$ window is

- preferred over the $0.85 \mu\text{m}$ window for long distance communication.
- Reason (R):** At $1.3 \mu\text{m}$ not only the attenuation of silica fiber is lower than that at $0.85 \mu\text{m}$, the pulse broadening at the long wavelength window is also minimum.
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not a correct explanation
 - A is true but R is false
 - A is false but R is true
92. **Assertion (A):** For transmitting audio frequency signals, antennas of several hundred kilometers length would be required.
- Reason (R):** For efficient radiation of electromagnetic energy to occur from an antenna, the wavelength of the radiated signal must be comparable with the physical dimensions of the antenna.
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not a correct explanation
 - A is true but R is false
 - A is false but R is true
93. **Assertion (A):** In a high frequency transmission line, when a voltage is applied across the line at the sending end, the voltage and current in the line change with distance.
- Reason (R):** A transmission line consists of continuous conductors with a cross-sectional configuration that is constant throughout their lengths.
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not a correct explanation
 - A is true but R is false
 - A is false but R is true
94. **Assertion (A):** MOSFET RAMs are usually slower than bipolar RAMs.
- Reason (R):** MOSFET RAMs in comparison with bipolar RAMs can be fabricated in much larger capacity in a single IC and consume much less power.
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not a correct explanation
 - A is true but R is false
 - A is false but R is true
95. **Assertion (A):** A BJT amplifier needs very good bias stabilization circuit as compared to that of an FET amplifier circuit.
- Reason (R):** The input p-n junction of FET amplifier is reverse biased and that of the BJT amplifiers forward biased.
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not a correct explanation
 - A is true but R is false
 - A is false but R is true
96. **Assertion (A):** A monostable multivibrator can be used as a counter.
- Reason (R):** The pulse width of the monostable multivibrator is a function of its input dc voltage.
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not a correct explanation
 - A is true but R is false
 - A is false but R is true
97. **Assertion (A):** For a periodic input voltage whose amplitude is large enough to pass through the trip points, a Schmitt trigger produces a rectangular wave-form at the output.
- Reason (R):** A Schmitt trigger is a comparator with positive feedback and hence prevents noise triggering.
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not a correct explanation
 - A is true but R is false
 - A is false but R is true
98. **Assertion (A):** The multistage intermediate frequency amplifier of superheterodyne radio receiver is always staggered tuned.
- Reason (R):** A very sharp tuned high gain amplifier is obtained maximizing the gain and increasing the fidelity of the receiver.
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not a correct explanation
 - A is true but R is false
 - A is false but R is true
99. **Assertion (A):** Three-phase transformers of different vector groups should not be operated in parallel.

Reason (R): Transformers belonging to different vector groups will not have the same phase sequence on the secondary side.

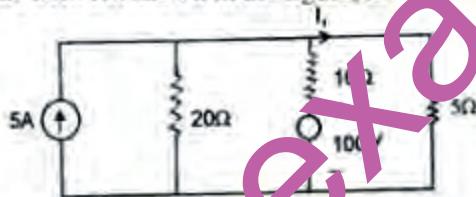
- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not a correct explanation
- A is true but R is false
- A is false but R is true

100. **Assertion (A):** In a 3-phase induction motor, the stator is to be wound for 4 poles but by mistake, the rotor is wound for 2 poles only. When the stator is fed from a 50Hz, 3-phase supply with rotor winding shorted, the motor does not start up. When however, the wound rotor is replaced by a squirrel-cage rotor, the machine operates without any problem.

Reason (R): Rotor of an induction motor should not have any poles.

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not a correct explanation
- A is true but R is false
- A is false but R is true

101. The current I_1 through the 5Ω resistor in the network shown in the figure, is



- 8.58 A
- 7.54 A
- 11.66 A
- 14 A

102. A lamp rated at 10watts, 50 volts is proposed to be used in 110 volts system. The voltage and resistance of the resistor to be connected in series with lamp should be

- 15 watts, 350 ohms
- 10 watts, 250 ohms
- 12 watts, 300 ohms
- 15 watts, 250 ohms

103. Match List I with List II and select the correct answer using the codes given below:

List I

- Superposition theorem
- Thevenin theorem

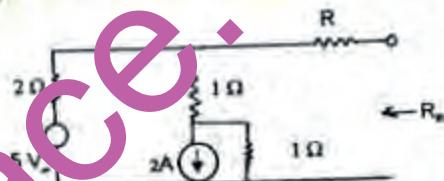
- Signal flow graph
- Complex frequency

List II

- Current source
- linearity
- s-plane
- mason's gain formula
- Voltage source

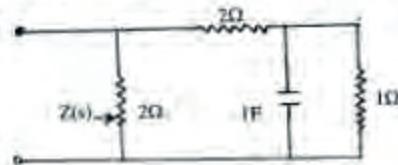
	A	B	C	D
a.	2	1	4	5
b.	1	2	4	5
c.	2	5	3	4
d.	2	5	4	3

104. Thevenin's equivalent resistance R_{th} for the network shown in the given figure is known to be 2Ω . The value of R in ohms is



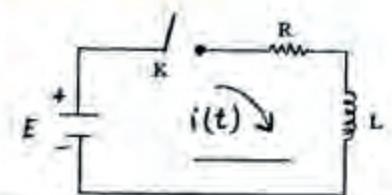
- 1
- 2
- 3
- 4

105. The driving-point impedance of the network shown in the figure is given by



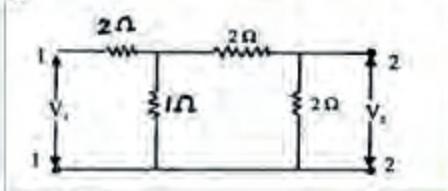
- $\frac{4(s+3/2)}{(s+5/4)}$
- $\frac{(s+3/2)}{(s+5/4)}$
- $\frac{(s+5/4)}{(s+3/2)}$
- $\frac{1(s+3/2)}{4(s+3/2)}$

106. The correct value of the current I (t) at any instant when K is switched on at $t = 0$ in the network in the given figure is



- a. $\frac{E}{R} + \frac{E}{R}e^{j\theta(L)t}$
 b. $\frac{E}{R} - \frac{E}{R}e^{(R/L)t}$
 c. $\frac{E}{R} + \frac{E}{R}e^{-(R/L)t}$
 d. $\frac{E}{R} - \frac{E}{R}e^{-(R/L)t}$

107. For the given two-port network, Z_{21} will be



- a. $2/5\Omega$
 b. $3/5\Omega$
 c. $1/5\Omega$
 d. $4/5\Omega$

108. If the driving-point admittance function of a 1-port network is $Y(s) = \frac{Ks}{s+\alpha}$, it can be realized using

- a. Series combination R, L
 b. Parallel combination of R, L
 c. Series combination of R, G
 d. Parallel combination of R, C

109. The pole-zero plot of a network function $H(s)$ is shown in the given figure. Which one of the following will be the correct nature of its frequency response plots?



- a. The amplitude plot will decay with frequency but the phase plot will be constant at all frequencies
 b. The amplitude plot will be constant but the phase plot will vary from $+180^\circ$ to

$+90^\circ$ as frequency varies from zero to infinity

- c. The amplitude and phase plots will be constant at all frequencies
 d. The amplitude plot will be constant but the phase plot will vary from $+180^\circ$ to 0° as the frequency varies from zero to infinity

110. In a series resonant circuit, which one of the following will increase on increasing the inductance to four times its value and reducing the capacitance to one-fourth of its value?

- a. Resonant frequency
 b. Current at resonant frequency
 c. Impedance at resonant frequency
 d. Selectivity of the circuit

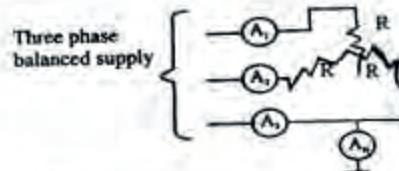
111. A series RLC circuit draws current at leading power factor at

- a. The resonant frequency
 b. Frequency less than the resonant frequency
 c. Frequencies more than the resonant frequency
 d. Frequencies both less and more than the resonant frequency

112. One of the two wattmeter has read zero in the two-wattmeter method of power measurement. This indicated that the load phase angle is

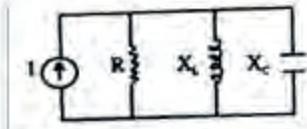
- a. 0°
 b. 30°
 c. 60°
 d. 90°

113. In the circuit shown in the given figure, three-phase supply is connected to a star-connected load. If ammeters A_1 , A_2 , A_3 read 12.5 A, what will be the reading of ammeter A_N ?



- a. 37.5A
 b. $\frac{37.5}{\sqrt{3}}A$
 c. $37.5\sqrt{3}A$
 d. Zero

114. For the circuit shown in the given figure, if $R = 10\Omega$, $X_L = 0.1\Omega$ and $X_C = 0.1\Omega$, then the current through R is



- a. 0
b. 101
c. 1
d. 0.11

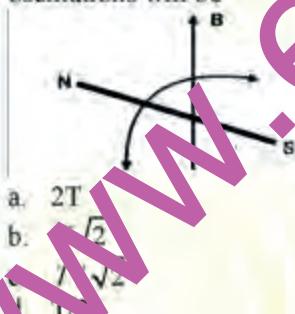
115. Two coupled coils have $L_1 = 0.6 \text{ H}$, $L_2 = 0.6 \text{ H}$ and coupling coefficient = 0.25. coil 2 has 800 turns. If current I_1 in coil is $6\sin 100t$ amps, then the voltage across coil 2 is

- a. $90\cos 100t$ volts
b. $9\cos 100t$ volts
c. $0.9\cos 100t$ volts
d. $0.09\cos 100t$ volts

116. If a charge of one coulomb is to be brought to a distance of one meter from a charge of 2 coulomb, then the work required is

- a. $\frac{1}{2\pi\epsilon_0} N - m$
b. $\frac{1}{4\pi\epsilon_0} N - m$
c. $2\pi\epsilon_0 N - m$
d. $4\pi\epsilon_0 N - m$

117. A small permanent magnet makes small oscillations in a uniform magnetic field as shown in the given figure. The period of oscillations is T. if the strength of the magnetic field is doubled, the period of oscillations will be



- a. $2T$
b. $\sqrt{2}$
c. $7/\sqrt{2}$
d. $1/T$

118. A uniform plane electromagnetic wave with electric component $E = E_m \cos(\omega t - px)$ propagates in vacuum along the positive x-direction. The mean pointing vector is given by

- a. $\frac{1}{2}\beta\epsilon_0 c^2 E_m^2 / \omega$
b. $\frac{1}{2}\beta\mu_0 c^2 E_m^2 / \omega$

- c. $\frac{1}{2}\beta\mu_0 c E_m / \omega$
d. $\frac{1}{2}\beta\beta\epsilon_0 c^2 E_m / \omega$

119. Match List I (Antenna) with List II (Application/Characteristics) and select the correct answer using the codes given below the lists:

List I

- A. A quarter wave monopole over ground plane
B. A vertical half-wave dipole
C. Folded dipole
D. Hertzian dipole (length $\ll \lambda/10$)

List II

1. radiation resistance $\ll \Omega$
2. radio broadcast
3. omnidirectional pattern
4. TV reception

Codes:

	A	B	C	D
a.	2	3	4	1
b.	2	3	1	4
c.	3	4	1	2
d.	3	4	2	1

20. In respect of a rectangular wave-guide of dimension $a \times b$, match List I (Mode) with List II (Cut-off wavelength) and select the correct answer using the codes given below the lists:

List I

- A. $TE_{0,1}$
B. $TE_{1,0}$
C. $TE_{2,0}$
D. $TE_{1,1}$

List II

1. $2a$
2. $2b$
3. $\frac{2ab}{\sqrt{a^2 + b^2}}$
4. a
5. b

	A	B	C	D
a.	2	1	3	4
b.	2	1	4	3
c.	4	5	3	1
d.	4	5	1	3