

RPSC AE 2025

ELECTRICAL ENGINEERING



EXAM PAPER WITH ANSWER KEY

EXAM DATE : 29 OCT. 2025

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2	4	17	1	32	4	47	3	62	3	77	2	92	1
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4	2	19	2	34	2	49	3	64	3	79	2	94	3
5	1	20	4	35	2	50	4	65	2	80	3	95	3
6	3	21	2	36	4	51	1	66	3	81	1	96	4
7	4	22	1	37	1	52	4	67	3	82	4	97	1
8	4	23	2	38	4	53	4	68	1	83	2	98	3
9	1	24	4	39	2	54	2	69	3	84	4	99	1
10	3	25	1	40	4	55	2	70	4	85	2	100	1
11	2	26	3	41	4	56	4	71	4	86	3		
12	4	27	3	42	4	57	2	72	4	87	1		
13	3	28	2	43	4	58	3	73	3	88	4		
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15	2	30	2	45	4	60	1	75	1	90	4		

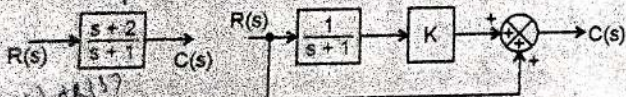
1. In Bode plot, if the low frequency asymptote is a horizontal line at x db, then the transfer function representing a type-0 system with a gain K is given by :

- (1) $10 \log K = x$
- (2) $100 \log K = x$
- (3) $20 \log K = x$
- (4) $K = \frac{1}{10} \log x$
- (5) Question not attempted

2. A DC motor with supply voltage 250 volts, having armature resistance = 0.5 ohm, total brush drop = 2 volt and back emf = 230 volts. Find the value of armature current.

- (1) 360 Amp
- (2) 46 Amp
- (3) 40 Amp
- (4) 36 Amp
- (5) Question not attempted

3. For what value of K , the two block diagrams as shown below are equivalent :



- (1) $(s+1)$
- (2) $(s+2)$
- (3) 1
- (4) 2
- (5) Question not attempted

The open loop transfer function of a unity feedback system is given by $G(s) = K(s+a)/(s^3 + 2s^2 + 2s + 1)$. What value of ' K ' and ' a ' will make the system marginally stable ?

- (1) $K = 5$ & $a = 5$
- (2) $K = 1$ & $a = 5$
- (3) $K = 5$ & $a = 1$
- (4) $K = 1$ & $a = 1$
- (5) Question not attempted

5. A 100 : 5 transformer is used in conjunction with a 5-ampere ammeter. If the latter reads 3.5 A, then the line current will be :

- (1) 70 A
- (2) 80 A
- (3) 50 A
- (4) 60 A
- (5) Question not attempted

6. For dc motors, which statement is correct ?

- (1) Compared to dc shunt motor, a dc series motor has low starting torque.
- (2) For 'LATHE' machine dc series motor is preferred.
- (3) In a dc shunt motor, there is very less change in speed from NO-Load to Full load compared to a dc series motor.
- (4) In a dc series motor, there is very less change in speed from No-Load to full load compared to a dc shunt motor.
- (5) Question not attempted

7. In a dc motor maximum power is developed when :

- (1) Value of back emf is $\frac{1}{4}$ of supply voltage.
- (2) Value of back emf is $\frac{3}{4}$ of supply voltage.
- (3) Value of back emf is equal to supply voltage
- (4) Value of back emf is half of supply voltage
- (5) Question not attempted

$$1 + \frac{K(s+a)}{s^3 + 2s^2 + 2s + 1}$$

$$s^3 + 2s^2 + 2s + 1 + K(s+a) = 0$$

$$s^3 + 2s^2 + (2+K)s + (1+Ka) = 0$$

$$1 + Ka - 2K - 4 = 0$$

$$(1+Ka) - 2K - 4 = 0$$

8. A 440-V. DC shunt motor has armature resistance of 0.8Ω and field resistance of 200Ω . Determine the Armature current when giving an output of 7.46 kW at 85 percent efficiency.

- (1) 14.75 A (2) 20.25 A
(3) 15.25 A (4) 17.75 A
(5) Question not attempted

9. In 3-phase slip ring induction motor, if we increase the rotor resistance

- (1) Starting torque will increase but the maximum torque will remain same.
(2) Starting torque will remain constant but the maximum torque will increase.
(3) The maximum torque will increase.
(4) Starting torque and maximum torque will increase.
(5) Question not attempted

10. A 12-pole, 3-phase alternator driven at a speed of 500 r.p.m. supplies power to an 8-pole, 3-phase induction motor. If the slip of the motor at full load is 3% , calculate the full load speed of motor.

- (1) 750.1 rpm (2) 650.2 rpm
(3) 727.5 rpm (4) 701.5 rpm
(5) Question not attempted

11. A 100 kVA transformer operates on full load having iron loss 1000 W , and copper loss is 1000 W at unity power factor. Calculate the efficiency of transformer on half-full load.

- (1) 81.36% (2) 97.56%
(3) 82.65% (4) 89.34%
(5) Question not attempted

12. A synchronous condenser means :

- (1) An over excited d.c. motor
(2) An under excited d.c. motor
(3) An under excited synchronous motor
(4) An over excited synchronous motor
(5) Question not attempted

13. A three-phase 440 V , 6 pole, 50 Hz , squirrel cage induction motor is running at a slip of 5% . The speed of stator magnetic field with respect to rotor magnetic field and speed of rotor with respect to stator magnetic fields are

- (1) Zero, 50 rpm
(2) 1000 rpm , 50 rpm
(3) Zero, 100 rpm
(4) 1000 rpm , 950 rpm
(5) Question not attempted

14. In the transformer, voltage regulation will be maximum at

- (1) Zero power factor
(2) Does not depend on the power factor
(3) Lagging power factor
(4) Leading power factor
(5) Question not attempted

15. Regarding V-Curve of an alternator, which statement is correct ?

- (1) V-Curve is drawn between speed and mechanical input torque to alternator.
(2) V-Curve is drawn between armature current and field current.
(3) V-Curve is drawn between induced emf and armature current.
(4) V-Curve is drawn between induced emf and field current.
(5) Question not attempted

16. Zero power factor method of an alternator is used to find its

- (1) Armature Resistance
- (2) Synchronous Speed
- (3) Efficiency
- (4) Voltage Regulation
- (5) Question not attempted

17. The oscillation of the rotor about its equilibrium position in synchronous machine is called

- (1) Hunting
- (2) Crawling
- (3) Synchronization
- (4) Cogging
- (5) Question not attempted

18. An induction motor when started on load, does not accelerate up to full speed but runs at $1/7^{\text{th}}$ of the rated speed. This tendency of motor is known as:

- (1) Crawling
- (2) Cogging
- (3) Locking
- (4) Plugging
- (5) Question not attempted

19. A 3-phase induction motor is operating at full load slip 's'. If fifth harmonic is existing then slip of rotor with respect to fifth harmonic field is:

- (1) $6 + 5s$
- (2) $6 - 5s$
- (3) $5s$
- (4) $s/5$
- (5) Question not attempted

20. While running, a synchronous motor is compelled to run at synchronous speed because of

- (1) induced e.m.f. in rotor field winding by stator flux
- (2) compulsion due to Lenz's law
- (3) damper winding in its pole faces
- (4) magnetic locking between stator and rotor poles
- (5) Question not attempted

21. A single-phase 50 Hz generator supplies an inductive load of 5000 kW at a p.f. of 0.707 (lagging) by means of a 20 km long transmission line. The line resistance and inductance are 0.0195 ohm and 0.63 mH per km. The voltage at receiving end is required to be kept constant at 10 kV. The sending end voltage of the line is equal to:

- (1) 22.19 kV
- (2) 12.17 kV
- (3) 09.63 kV
- (4) 31.27 kV
- (5) Question not attempted

22. Which one of the following is not true in the case of 3-phase induction motor?

- (1) It need extra starting motor.
- (2) It's speed decreases with increase in load.
- (3) It has robust and rugged construction.
- (4) It requires minimum of maintenance.
- (5) Question not attempted

23. Three loads are connected in parallel across a 1400 V rms, 60 Hz, Single phase supply:

Load 1 : Inductive load, 35 kW and 120 KVAR

Load 2 : Capacitive load, 10 kW and 40 KVAR

Load 3 : Resistive load of 15 kW

Total active and reactive loads are

- (1) 60 kW, 100 KVAR
- (2) 60 kW, 80 KVAR
- (3) 80 kW, 60 KVAR
- (4) 100 kW, 80 KVAR
- (5) Question not attempted

$$\begin{array}{r} 35 \text{ kW} \quad 35 \\ 120 \\ \hline 10 \times 10 \\ \hline 40 \end{array}$$

$$\begin{array}{r} 15 \\ 35 + 35 \\ \hline 120 \end{array} \quad \begin{array}{r} 15 \\ 36 \end{array}$$

$$V_L = 5 \sqrt{\frac{500 \times 10^6}{0.01}}$$

$$\frac{104 \times 5 \sqrt{5}}{5058 \text{ kV}}$$

24. In a system of 132 kV, the line to ground capacitance is $0.01 \mu\text{F}$ and the inductance is 5 Henries. Determine the voltage appearing across the pole of a circuit breaker if a magnetising current of 5 amps is interrupted.

- (1) 165.5 kV (2) 255.5 kV
(3) 210.5 kV (4) 111.8 kV
(5) Question not attempted

25. A circuit breaker is rated at 1200 amps, 1500 MVA, 33 kV, 3-sec, 3-phase oil circuit breaker. The rated symmetrical breaking current will be:

- (1) 24.25 kA (2) 37 kA
(3) 67 kA (4) 26.25 kA
(5) Question not attempted

26. A 500 MVA, 22 kV, 60 Hz, four pole turbo-generator has an inertia constant, $H = 7.5 \text{ MJ/MVA}$. If the mechanical power input is 552 MW and the electrical power output is 400 MW, with stator copper losses assumed to be negligible, determine the angular acceleration of the rotor.

- (1) 537.8 elec-degree/sec²
(2) 837.8 elec-degree/sec²
(3) 437.8 elec-degree/sec²
(4) 337.8 elec-degree/sec²
(5) Question not attempted

27. It is found that the receiving end voltage of a long transmission line is greater than sending end voltage on no load. This might happen due to which of the transmission line parameters?

- (1) Resistance (2) Conductance
(3) Capacitance (4) Inductance
(5) Question not attempted

28. The resultant transient voltage which appears across the breaker contacts at the instant of arc extinction is called

- (1) Arc voltage
(2) Restriking voltage
(3) System voltage
(4) Recovery voltage
(5) Question not attempted

29. The surge impedance of a 100 kilometre long underground cable is 50 "ohms". The surge impedance of a 40 kilometre long similar cable would be:

- (1) 80 ohms (2) 125 ohms
(3) 20 ohms (4) 50 ohms
(5) Question not attempted

30. Corona loss increases with

- (1) decrease frequency and increase diameter of conductor
(2) increase frequency and decrease diameter of conductor
(3) increase frequency and increase diameter of conductor
(4) decrease frequency and decrease diameter of conductor
(5) Question not attempted

31. Consider the following statements regarding the addition of lumped capacitances in parallel to a lossless transmission line:

- a. It increases the characteristic impedance.
b. It increases the propagation constant.
c. It enhances system stability
d. It increases the charging current.

Which of the above statements are correct?

- (1) a, b and d (2) b and d
(3) a and c (4) b, c and d
(5) Question not attempted

32. Limitation of HVDC system is :
- (1) Poor voltage regulation
 - (2) Lower transmission losses
 - (3) No skin effect
 - ~~(4) Voltage transformation is not easier~~
 - (5) Question not attempted

33. Heavy use of shunt capacitor compensation could lead to
- ~~(1) Increased flow of active power~~
 - (2) Increased surge impedance
 - (3) Reduction of small signal stability margin
 - (4) Improved voltage regulation
 - (5) Question not attempted

34. If the fault current is 3000 A for a relay with a plug setting of 50% and CT ratio of 1000:1, the plug setting multiplier would be

- (1) 4
- ~~(2) 6~~
- (3) 2.5
- (4) 3.5
- (5) Question not attempted

35. With respect to protective relays, evaluate the validity of the following statements:

- a. The minimum current at which a relay just begins to operate is termed its pick-up value.
- b. If a relay has a pick-up current of 7.5 A and is subjected to a fault current of 30 A, its plug-setting multiplier (PSM) is 5.
- c. Earth fault currents are generally lower than three-phase short circuit currents.
- d. Induction relays are suitable for operation on both a.c. and d.c. quantities.

Which of the above statements are correct?

- (1) a, b and d
- ~~(2) a and c~~
- (3) b and c
- (4) a and b
- (5) Question not attempted

36. Nuclear power station is normally used for

- (1) Sudden change of loading condition
- (2) Power factor correction
- (3) Peak load
- ~~(4) Base load~~
- (5) Question not attempted

37. Positive sequence impedance of a fully transposed transmission line is

- ~~(1) equal to negative sequence impedance~~
- (2) always zero
- (3) 3 times negative sequence impedance
- (4) $\frac{1}{3}$ of negative sequence impedance
- (5) Question not attempted

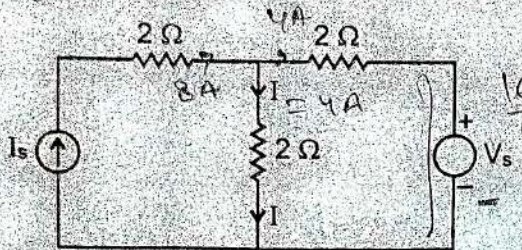
38. Out of following, which statement is not true with regard to desirable property in conductor material used for transmission and distribution of electrical power?

- (1) Low cost so that it can be used for long distances
- (2) High tensile strength
- (3) High electrical conductivity
- ~~(4) High specific gravity~~
- (5) Question not attempted

39. Economiser is used to raise the temperature of

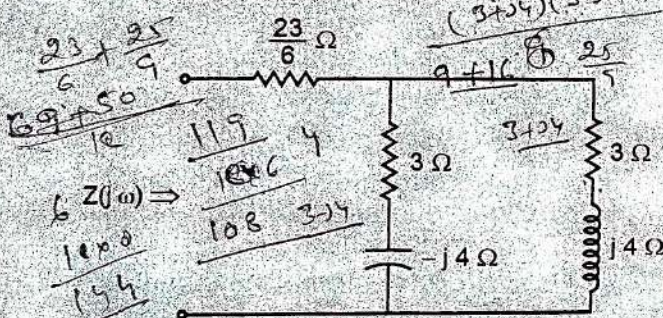
- (1) Steam
- ~~(2) Feed water~~
- (3) Coal
- (4) Air
- (5) Question not attempted

40. For the circuit shown below, $V_s = 0$, when $I = 4$ Amp. The value of 'I' for $V_s = 16$ Volt is



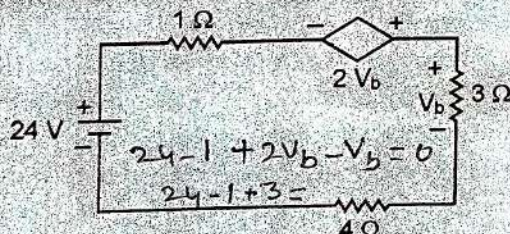
- (1) 4 Amp (2) 0 Amp
(3) 16 Amp (4) 8 Amp
(5) Question not attempted

41. The total impedance $Z(j\omega)$ of the circuit shown below is



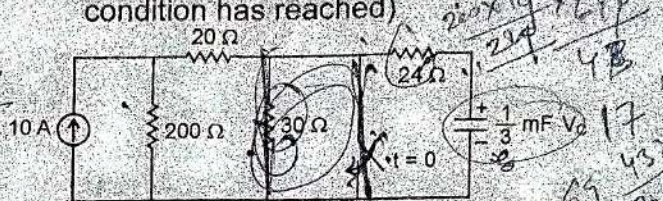
- (1) $(0 + j8)$ ohm (2) $(6 + j8)$ ohm
(3) $(6 + j0)$ ohm (4) $(8 + j0)$ ohm
(5) Question not attempted

42. The current in the given circuit is:



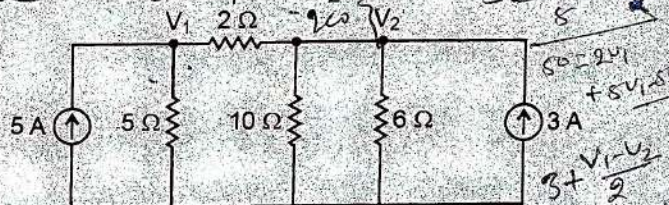
- (1) 14 A (2) 16 A
(3) 10 A (4) 12 A
(5) Question not attempted

43. For the circuit shown below, find the voltage across the capacitor before the switch is closed (steady state condition has reached)



- (1) 0 Volt (2) 300 Volt
(3) 190 Volt (4) 240 Volt
(5) Question not attempted

44. For the circuit shown below, nodal voltages V_1 and V_2 are:



- (1) $V_1 = 22.6$ V, $V_2 = 20.3$ V
(2) $V_1 = 25.5$ V, $V_2 = 15.06$ V
(3) $V_1 = 9.59$ V, $V_2 = 8.1$ V
(4) $V_1 = 18.59$ V, $V_2 = 16.02$ V
(5) Question not attempted

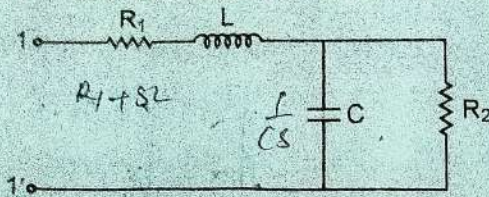
45. Two coils have self inductances, $L_1 = 1.6$ H and $L_2 = 0.1$ H. The coupling co-efficient between coils is 0.5, the turn ratio between the coils (N_1/N_2) is:

- (1) 3 (2) 4
(3) 1 (4) 2
(5) Question not attempted

46. The Laplace Transform of the function $f(t) = \cos(\omega t) \cdot u(t)$ is given by

- (1) $\frac{s}{(s + \omega)}$ (2) $\frac{s}{(s^2 + 1)}$
(3) $\frac{s^2}{(s^2 + \omega^2)}$ (4) $\frac{s}{(s^2 + \omega^2)}$
(5) Question not attempted

47. The driving point impedance at port 1-1' of the network shown below is :



- (1) $R_1 + SL + \frac{1}{CS} + R_2$
 (2) $R_1 + SL + \frac{R_1}{(1 + R_2CS)}$
 (3) $R_1 + SL + \frac{R_2}{(1 + R_2CS)}$
 (4) $R_2 + SL + \frac{R_1}{(1 + R_1CS)}$
 (5) Question not attempted

48. For a 2-port network, the voltage gain is given by

$$\frac{V_2(s)}{V_1(s)} = \frac{s}{(s+2)(s+3)}$$

for a unit-impulse input, the output of the network is :

- (1) $v_2(t) = 2e^{-3t} + e^{-2t}$
 (2) $v_2(t) = 4e^{-2t} - e^{-3t}$
 (3) $v_2(t) = 2e^{-2t} + 3e^{-3t}$
 (4) $v_2(t) = -2e^{-2t} + 3e^{-3t}$
 (5) Question not attempted

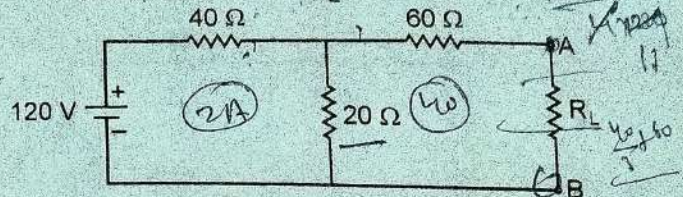
49. The impedance of a parallel RLC circuit is given by

$$Z_s = \frac{s}{20(s^2 + 2s + 101)}$$

the resonance frequency of this circuit is :

- (1) 7.1 rad/sec (2) 14.21 rad/sec
 (3) 10.05 rad/sec (4) 5.25 rad/sec
 (5) Question not attempted

50. In the circuit shown below, for maximum power transfer, value of load resistance ' R_L ' is :



- (1) 146.68 Ω (2) 148.35 Ω
 (3) 136.7 Ω (4) 73.34 Ω
 (5) Question not attempted

51. Two coupled coils with $L_1 = 0.01$ H, $L_2 = 0.04$ H and $K = 0.6$ are connected in two different ways, Series Aiding and Series Opposing. The equivalent inductances in the two cases are :

- (1) 0.074 Henry and 0.026 Henry
 (2) 0.026 Henry and 0.074 Henry
 (3) 0.012 Henry and 0.074 Henry
 (4) 0.074 Henry and 0.012 Henry
 (5) Question not attempted

52. A coil takes a current of 2 A when connected to a 240 V, 25 Hz sinusoidal supply, consumes 200 W. The inductance of coil is :

- (1) 0.173 H (2) 1.3 H
 (3) 0.347 H (4) 0.694 H
 (5) Question not attempted

53. The black-box N contains resistors and independent sources. If $I = 3$ A and 1.5 A for $R = 0$ and 2 Ω , respectively, then what is the value of I for $R = 1$ Ω ?



- (1) 3 A (2) 4 A
 (3) 1 A (4) 2 A
 (5) Question not attempted

54. The equivalent coordinate of $\vec{A} = 2\hat{a}_x - 2\hat{a}_y + 3\hat{a}_z$ in cylindrical coordinate system is

- (1) $\left(\sqrt{8}, \frac{\pi}{4}, 3\right)$ (2) $\left(\sqrt{8}, \frac{3\pi}{4}, 3\right)$
 (3) $\left(\sqrt{17}, \frac{3\pi}{4}, 3\right)$ (4) $\left(\sqrt{17}, \frac{\pi}{4}, 3\right)$
 (5) Question not attempted

55. Displacement current in a dielectric material is

- (1) The current due to time-varying magnetic flux density
 (2) The current due to time-varying electric flux density
 (3) The current due to movement of free electrons in the material
 (4) The current due to a steady electric field
 (5) Question not attempted

56. Unit of the permittivity of free space ϵ_0 is

- (1) Coulomb²/(Newton.meter)
 (2) ϵ_0 is a dimensionless constant
 (3) Farad/meter²
 (4) Coulomb²/(Newton.meter²)
 (5) Question not attempted

57. Stoke's theorem relates

- (1) Closed surface integral to a closed line integral
 (2) Surface integral to a closed line integral
 (3) Volume integral to a closed surface integral
 (4) Volume integral to a closed line integral
 (5) Question not attempted

58. Which of the following is correct for relationship between carrier density (n) and Temperature (T) magnetic material, if x is a rational number?

- (1) $n \propto \frac{T}{x}$ (2) $n \propto T \cdot (x)$
 (3) $n \propto T^x$ (4) $n \propto \frac{1}{T^x}$
 (5) Question not attempted

59. Which of the following is NOT a type of polarization in dielectrics?

- (1) Electronic polarization
 (2) Ionic polarization
 (3) Orientational polarization
 (4) Meissner polarization
 (5) Question not attempted

60. The correct statement for the Ferromagnetic material is:

- (1) Atoms have parallel aligned magnetic moments
 (2) Atoms have mixed parallel and anti parallel aligned magnetic moments
 (3) Atoms have no magnetic moment
 (4) Atoms have randomly oriented magnetic moments
 (5) Question not attempted

61. The work done in carrying a charge through an equipotential surface:

- (1) is infinity
 (2) depends on the distance
 (3) is zero
 (4) depends on the charge Q
 (5) Question not attempted

62. In ferrimagnetic materials, the neighbouring spin lattices are

- (1) Antiparallel but of equal magnitude
 (2) Parallel but of unequal magnitude
 (3) Antiparallel but of unequal magnitude
 (4) Parallel but of equal magnitude
 (5) Question not attempted

63. Wattmeter are compensated for errors caused by inductance of pressure coil by

- (1) Connecting resistor in parallel with multiplier
- (2) Connecting resistor and inductor in series with multiplier
- (3) Connecting capacitor in series with multiplier
- (4) Connecting capacitor in parallel with multiplier
- (5) Question not attempted

64. Which of the following is correct for susceptibility of Diamagnetism ?

- (1) Large & positive
- (2) Large & negative
- (3) Small & negative
- (4) Small & positive
- (5) Question not attempted

65. We have various bridge and the parameters to be measured by a particular bridge. Match List-1 (Bridge) with List-2 (Parameter to be measured) and select the correct answer :

- | List-1 | List-2 |
|----------------------|--|
| I. Maxwell's Bridge | A. Frequency |
| II. Hay's Bridge | B. Inductance of medium Q Coils ($1 < Q < 10$) |
| III. Schering Bridge | C. Inductance of high Q Coils ($Q > 10$) |
| IV. Wein's Bridge | D. Capacitance |

	I	II	III	IV
(1)	B	A	D	C
(2)	B	C	D	A
(3)	D	C	B	A
(4)	D	A	B	C
(5)	Question not attempted			

66. A moving coil ammeter having a resistance of 1.5 ohm gives full scale deflection when a current of 15 mA is passed through it. The instrument can be used for the measurement of voltage upto 15 Volt by

- (1) Connecting a resistance of 1000 ohm parallel to the load
- (2) Connecting a resistance of 1000 ohm in series with the load
- (3) Connecting a resistance of 998.5 ohm in series with the ammeter
- (4) Connecting a resistance of 1000 ohm parallel to the ammeter
- (5) Question not attempted

67. A resistance is rated at 3200 ohm and the current flowing through this is 64 mA. It was later found that the resistance of resistor was 0.2 percent greater than specified resistance and the ammeter read 0.75 percent more than true current. The relative error in power is equal to

- (1) 1.5 percent less
- (2) 1.7 percent more
- (3) 1.3 percent more
- (4) 1.5 percent more
- (5) Question not attempted

68. In a saturable core frequency meter, the output current is measured by

- (1) Electrodynamic ammeter
- (2) Hot wire ammeter
- (3) Moving iron ammeter
- (4) Permanent magnet moving coil ammeter
- (5) Question not attempted

69. The output of LVDT is 3 V at maximum displacement. At a load of 1 MΩ, the deviation from linearity is maximum and it is ± 0.003 V from a straight line through origin. The linearity at the given load is

- (1) $\pm 0.04\%$ (2) $\pm 1.0\%$
 (3) $\pm 0.1\%$ (4) $\pm 0.2\%$
 (5) Question not attempted

70. Which of the following is a passive transducer?

- (1) Photovoltaic Cell
 (2) Piezoelectric pickup
 (3) Thermocouple
 (4) LVDT
 (5) Question not attempted

71. Thermistors used for measurement are essentially

- (1) Semiconductor devices with low negative temperature coefficient
 (2) A pure resistance with negative temperature coefficient
 (3) A pure resistance with positive temperature coefficient
 (4) Semiconductor devices with high negative temperature coefficient
 (5) Question not attempted

72. Match the transducers in List-A with their type in List-B.

- | List-A | | | List-B | | |
|------------------------------|--|---------------|--------|--|--|
| I. LVDT | | A. Resistive | | | |
| II. Strain gauge | | B. Inductive | | | |
| III. Smartphone touch screen | | C. Capacitive | | | |

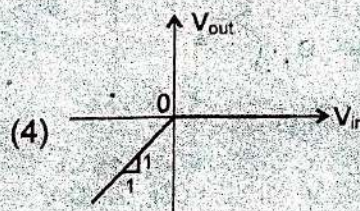
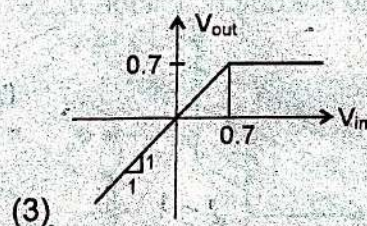
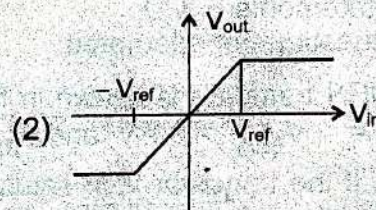
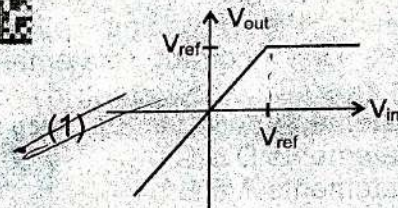
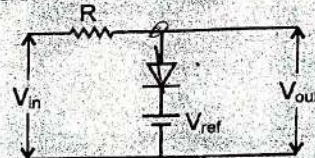
- | | | | |
|-----|---|----|-----|
| | I | II | III |
| (1) | A | C | B |
| (2) | C | A | B |
| (3) | A | B | C |
| (4) | B | A | C |

(5) Question not attempted

73. Piezoelectric accelerometer converts energy to energy.

- (1) mechanical, sound and vice-versa
 (2) electrical, sound and vice-versa
 (3) mechanical, electrical and vice-versa
 (4) electrical, chemical and vice-versa
 (5) Question not attempted

74. For the diode circuit shown, which is the correct voltage transfer characteristic drawn between V_{out} versus V_{in} . Assume ideal diode behaviour for diode.



(5) Question not attempted

75. In a system with x_1 and x_2 as input and output quantities respectively, the gain x_2/x_1 is required to be expressed in decibel (dB). Following 4 statements were presented for the same:

A. $10 \log_{10} \left(\frac{x_2}{x_1} \right)$ where x_1, x_2 are voltages in Volt.

B. $20 \log_{10} \left(\frac{x_2}{x_1} \right)$ where x_2, x_1 are currents in Ampere.

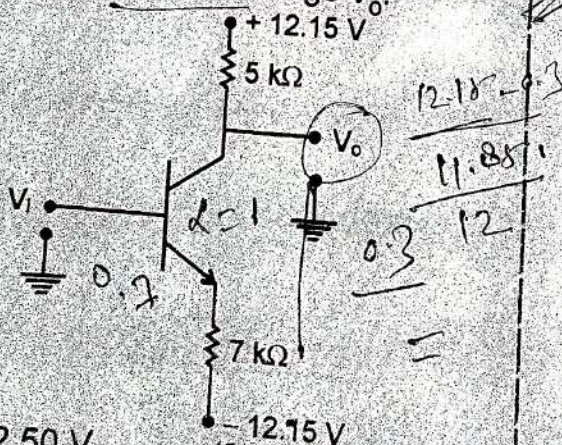
C. $20 \ln \left(\frac{x_2}{x_1} \right)$ where x_1, x_2 are either voltages or currents.

D. $10 \log_{10} \left(\frac{x_2}{x_1} \right)$ where x_1, x_2 are powers in W.

Which of the following options identifies the correct statements among these?

- (1) Statements A & C
- (2) Statements D & C
- (3) Statements A & B
- (4) Statements B & D
- (5) Question not attempted

76. The NPN transistor is shown in figure with $\alpha = 1$, $V_{BEON} = 0.7$ V, and $V_{CEsat} = 0.3$ V. If the transistor is in saturation, then find the output voltage V_o .

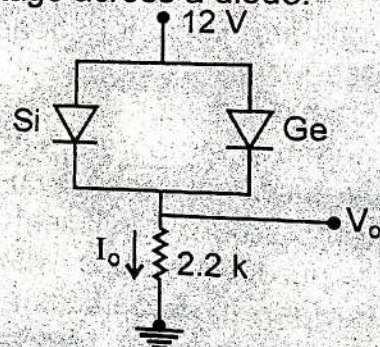


- (1) 2.50 V
- (2) 2.00 V
- (3) 2.15 V
- (4) 1.85 V
- (5) Question not attempted

77. The Boolean expression $AB + AC$ is equivalent to

- (1) $ABC + A\bar{B}C + B'C$
- (2) $ABC + ABC' + AB'C$
- (3) $AB + AC + BC$
- (4) $AB'C' + ABC' + A\bar{B}C$
- (5) Question not attempted

78. Both the diodes used in given circuit behave as a short circuit when $V_D > V_\gamma$ and as an open circuit when $V_D < V_\gamma$, where V_γ is the cut-in voltage of the diode. If Silicon diode has V_γ as 0.7 V and Germanium diode has V_γ as 0.3 V, the current I_o would be _____ mA. V_D is the voltage across a diode.



- (1) 5.45
- (2) 0 V
- (3) 5.14
- (4) 5.32
- (5) Question not attempted

79. Assertion (A) : P-channel MOSFETs allow faster switching speeds as compared to N-channel MOSFETs.

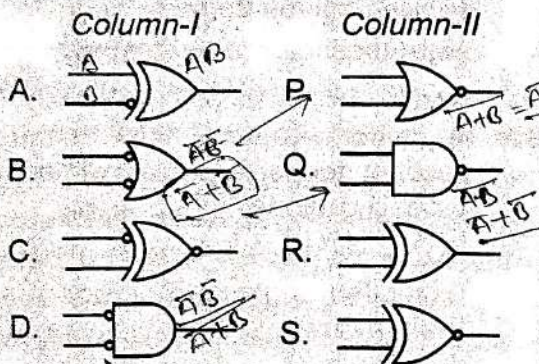
Reason (R) : Mobility of electrons is greater than that of holes.

- (1) (A) is true, but (R) is false.
- (2) (A) is false, but (R) is true.
- (3) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (4) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- (5) Question not attempted

80. The type of detector required to demodulate the signal $s(t) = 10 \cos 10^5 \pi t + 15 \cos 1000 \pi t \cos 10^5 \pi t$ is

- (1) Rate detector
- (2) PLL
- (3) Envelope detector
- (4) Coherent detector
- (5) Question not attempted

81. Match the logic gates in Column-I with their equivalents in Column-II.



- | A | B | C | D |
|-------|-------|---|---|
| (1) S | (2) Q | R | P |
| (2) P | R | S | Q |
| (3) R | Q | S | P |
| (4) R | P | Q | S |
- (5) Question not attempted

82. Which one of the following has small power dissipation and high noise immunity?

- (1) Emitter Coupled Logic (ECL)
- (2) NMOS
- (3) Transistor Transistor Logic (TTL)
- (4) CMOS
- (5) Question not attempted

83. The total number of cells in a three variables Karnaugh map is

- (1) 10
- (2) 8
- (3) 12
- (4) 4
- (5) Question not attempted

84. In 8085 microprocessor, during a subroutine CALL, the return address is saved

- (1) In the program counter
- (2) At the interrupt vector location
- (3) In the HL pair
- (4) In the stack
- (5) Question not attempted

85. Which of the following is a non-maskable interrupt in 8085?

- (1) INTA
- (2) TRAP
- (3) INT
- (4) RST7.5
- (5) Question not attempted

86. Which interrupt pin in 8085 is used by 8259 programmable interrupt controller to send the interrupt request?

- (1) RST7.5
- (2) TRAP
- (3) INT
- (4) INTA
- (5) Question not attempted

87. Intel 8085 microprocessor has

- (1) 8 bit data bus and 16 bit address bus
- (2) 16 bit data bus and 16 bit address bus
- (3) 8 bit data bus and 8 bit address bus
- (4) 16 bit data bus and 8 bit address bus
- (5) Question not attempted

88. HOLD pin in 8085 microprocessor is used as a handshake signal to interface with

- (1) Programmable interrupt controller chip
- (2) Hard disk memory
- (3) Programmable interval timer chip
- (4) DMA controller chip
- (5) Question not attempted

89. In a power circuit of 3 kV, four thyristors each of rating 800 V are connected in series. The percentage series derating factor will be

- (1) 12.5 (2) 6.25 (3) 50 (4) 25 (5) Question not attempted

90. A step-up dc chopper has input voltage of 110 V and output voltage of 330 V. Turn-off time is 200 μ -sec, 'duty ratio' of the chopper is :

- (1) 1/2 (2) 1/9 (3) 1/3 (4) 2/3 (5) Question not attempted

91. In a PWM inverter, f_c and f are the frequencies for the carrier signal and reference signal, respectively. Then the number of pulses per half cycle is

- (1) $N = f_c/2f$ (2) $N = f_c/f$ (3) $N = f/f_c$ (4) $N = f/2f_c$ (5) Question not attempted

92. In a three-phase full wave a.c. to d.c. converter, the ratio of output ripple frequency to the supply voltage frequency is

- (1) 6 (2) 12 (3) 2 (4) 3 (5) Question not attempted

93. The Nyquist stability criterion is written as $N = P - Z$ where N is the number of anti-clockwise encirclements of the critical point by the Nyquist plot, P is the number of Open-loop poles in the right half of the s-plane and Z is the number of in the right half of s-plane.

- (1) Closed loop poles (2) Open loop poles (3) Closed loop zeroes (4) Open loop zeroes (5) Question not attempted

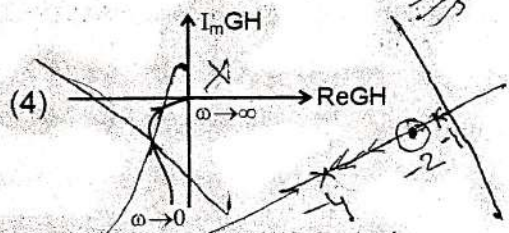
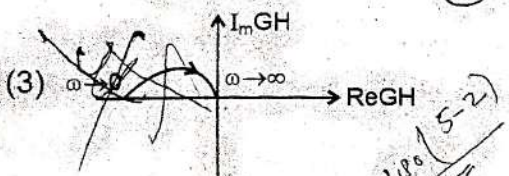
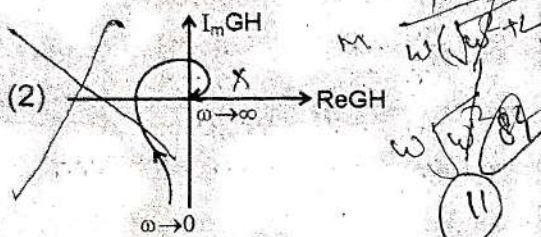
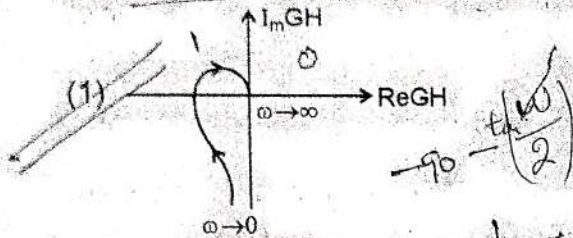
94. A single phase half controlled rectifier feeds R-L load without free wheeling diode. Input supply voltage is ' $V_m \sin \omega t$ '. Firing angle is ' α ' and extinction angle is ' β '. If $(\pi < \beta < 2\pi)$ then average output voltage of the rectifier is :

- (1) $\frac{V_m}{2\pi} (\cos \alpha + \cos \beta)$ (2) $\frac{V_m}{2\pi} \cos (\beta - \alpha)$ (3) $\frac{V_m}{2\pi} (\cos \alpha - \cos \beta)$ (4) $\frac{V_m}{\pi} (\cos \alpha - \cos \beta)$ (5) Question not attempted

95. Consider a unity feedback control system with open loop transfer function $G(s) = \frac{K(s+1)}{s(s+2)(s+3)}$. The steady state error of the system due to a unit step input is

- (1) 6/K (2) Infinite (3) Zero (4) K/6 (5) Question not attempted

96. Which of the following is the polar plot of the transfer function $GH(s) = 2/s(s+2)$?



(5) Question not attempted

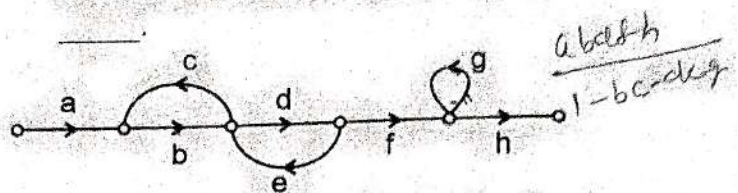
97. The open loop transfer function of a unity feedback system is given as $G(s) = K(s+2)/(s+1)(s+4)$. Which of the following statements is/are true for the root loci of the system?

Statement A : Root loci on the real axis will lie between $(-1 \text{ \& } -2)$ and $(-4 \text{ \& } -\infty)$.

Statement B : Centroid of the asymptotes will be at $s = -3$ and the angle of the asymptotes will be $\pm 90^\circ$.

- (1) Both A and B are true.
 (2) Both A and B are false.
 (3) A is true, but B is false.
 (4) A is false, but B is true.
 (5) Question not attempted

98. The overall gain of a system having the signal flow graph shown below is



- (1) $abdfh/1 + bc + de + g + bcg + deg$
 (2) $abdfh/1 + bc + de + g - bcg - deg$
 (3) $abdfh/1 - bc - de - g + bcg + deg$
 (4) $abdfh/1 - bc - de - g - bcg - deg$
 (5) Question not attempted

99. A linear time invariant system initially at rest, when subjected to a unit step input, gives a response $y(t) = te^{-t}$, $t > 0$, the transfer function of the system is :

- (1) $\frac{s}{(s+1)^2}$ (2) $\frac{1}{s(s+1)}$
 (3) $\frac{1}{(s+1)^2}$ (4) $\frac{1}{s(s+1)^2}$
 (5) Question not attempted

100. The transfer function of a second order system is given as $5/(s^2 + 2s + 25)$.

The peak time of the system is

- (1) $\frac{\pi}{\sqrt{24}}$ (2) $\frac{\pi}{\sqrt{96}}$
 (3) $\frac{2\pi}{\sqrt{24}}$ (4) $\frac{\pi}{\sqrt{3/2}}$
 (5) Question not attempted