ENTRANCE EXAMINATION FOR ADMISSION, MAY 2011.

Ph.D. (ELECTRICAL AND ELECTRONICS ENGINEERING)

COURSE CODE : 141

Register Number :

Signature of the Invigilator
(with date)

COURSE CODE : 141

Time : 2 Hours

Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you –1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. The Laplace transform of a function $f(t)$ is given by $F(s) = \frac{1}{(s^2+1)^2}$. The value of the integral $\int_0^\infty f(t)e^{-2t}\,dt$ is

(A) 0 (B) 0.04 (C) 4 (D) ∞

2. A real valued periodic function $f(t)$ has period T. The Fourier series expansion contains no terms of frequency $w = 2\pi\,(K/T)$, $K = 1, 2, \cdots$ and no sine terms. Then the function $f(t)$ satisfies

(A) $f(t) = -f(t-T)$ (B) $f(t) = f(t-T)$

(C) $f(t) = -f(t-T/2)$ (D) $f(t) = f(t-T/2)$

3. For the differential equation, $\frac{dy}{dx} + 5y = 0$, with $f(0) = 1$, the general solution is of the form

(A) e^{5t} (B) e^{-5t} (C) $5e^{-5t}$ (D) $e^{-\sqrt{5}t}$

4. Newton Raphson iterative formula for the solution of $x^2 - 1 = 0$ is

(A) $x_{i+1} = +\left(x_i^2 - 1\right)/2x_i$ (B) $x_{i+1} = +\left(x_i^2 + 1\right)/2x_i$

(C) $x_{i+1} = +\left(2x_i^2 - 1\right)/2x_i$ (D) $x_{i+1} = \frac{2x_i}{2x_i^2 + 1}$

5. $\underset{x \to \infty}{Lt} \frac{\sin x}{x}$ is equal to

(A) 0 (B) -1 (C) ∞ (D) $+1$

6. The minimum point of the function $\left(\frac{x^2}{3} - x\right)$ is at

(A) $x = 1$ (B) $x = 3/2$ (C) $x = 0$ (D) $x = \frac{1}{\sqrt{3}}$

7. A bag contains 8 white balls and 6 red balls. The probability of drawing two balls of the same colour is

(A) $\frac{21}{91}$ (B) $\frac{13}{11^2}$ (C) $\frac{43}{91}$ (D) $\frac{41}{91}$

8. The rank of the matrix A, is given by $A = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 4 & 2 & 3 & 0 \\ 1 & 0 & 0 & 0 \\ 4 & 0 & 3 & 0 \end{bmatrix}$

(A) 0 (B) 1 (C) 2 (D) 3

9. The matrix $A = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

(A) orthogonal (B) non-orthogonal

(C) singular (D) non-singular

10. The Z-transform of a discrete unit step function is given by

(A) $\frac{Z}{Z+1}$ (B) $\frac{Z+1}{Z}$ (C) $\frac{Z}{Z-1}$ (D) $\frac{Z-1}{Z}$

11. An overhead line conductor is composed of three identical strands each of radius 'r' and arranged as shown in figure. The self GND of the conductor is given by

(A) $2^{1/3} \cdot r$ (B) $2^{4/9} \cdot r$ (C) $2^{2/3} \cdot r$ (D) $2^{8/9} \cdot r$

12. The insulation resistance of a single core of certain length is R ohms, the insulation resistance of the same cable, when the length is doubled will be

(A) $\frac{R}{2}$ (B) R (C) $2R$ (D) R^2

13. For an overhead transmission line, the resistance per phase is R and reactance per phase is X. The ultimate power transmitted will be maximum when

(A) $X = R$ (B) $X = \sqrt{2}\ R$ (C) $X = \sqrt{3}R$ (D) $X = 2R$

14. Use of bundled conductors is O/H line

(A) reduces the reactance of the line and increases the radio interference

(B) reduces both the reactance and interference

(C) increases the reactance of the line and reduces the radio interference

(D) increases both the inductance and interference

15. In corona calculations, air density factor is used, which is

(A) directly proportional to temperature and atmospheric pressure

(B) inversely proportional to temperature and pressure

(C) directly proportional to temperature and inversely proportional to pressure

(D) directly proportional to pressure and inversely proportional to temperature

16. Match List 1 and List 2 and select the correct answer :

List 1		List 2	
1.	Mho relay	(a)	Generator protection
2.	Buchhalz relay	(b)	Motor protection
3.	Differential relay	(c)	Transformer protection
4.	Thermal relay	(d)	Line protection

(A) 1 – (b), 2 – (a), 3 – (d), 4 – (c)

(B) 1 – (c), 2 – (d), 3 – (a), 4 – (b)

(C) 1 – (d), 2 – (b), 3 – (a), 4 – (c)

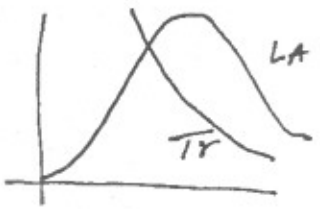
(D) 1 – (d), 2 – (c), 3 – (a), 4 – (b)

17. A 3 phase, 50 Hz, 4-pole, 20 MVA, 11 kV alternator has the inertia constant of 9 sec. If the input minus losses is 20 Mw and the output is 16 Mw, then the acceleration in abc. degree/sec^2 is

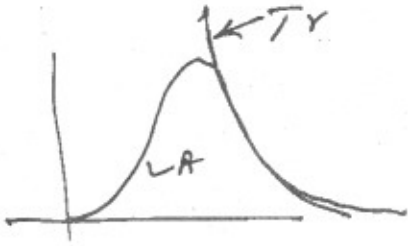
(A) 100 (B) 200 (C) 300 (D) 400

18. Voltage-time characteristics of a lightening arrestor and a transformer are shown in figure for proper insulation coordination, the suitable characteristic is

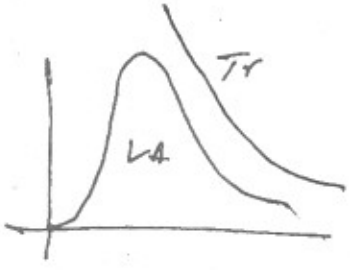
(A)



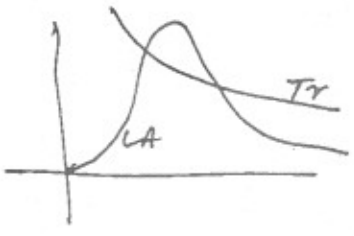
(B)



(C)



(D)



19. Current chopping may occur in the following circuit breaker :

(A) Bulk oil (B) Air blast (C) Minimum oil (D) SF_6

20. The surge impedance of a line is given by

(A) $\sqrt{L/C}$ (B) $\sqrt{C/L}$ (C) $\sqrt{LC}$ (D) $\sqrt{\frac{1}{LC}}$

21. A system is said to be linear

(A) if it obeys the maximum power transfer principle

(B) if it obeys the principle of super position

(C) if its output remains constant

(D) if it obeys the law of gravity

22. A linear time invariant system is said to be stable if

(A) its impulse response is absolutely integrable

(B) it is casual

(C) the output is bounded for any input

(D) the output is time invariant

23. A white noise is that signal whose spectrum

(A) extends over infinite range

(B) has spectral density varying as $1/t$

(C) has flat spectral density

(D) has limited number of frequency components

24. The poles and zeros of a transfer function, are the frequencies at which the function value

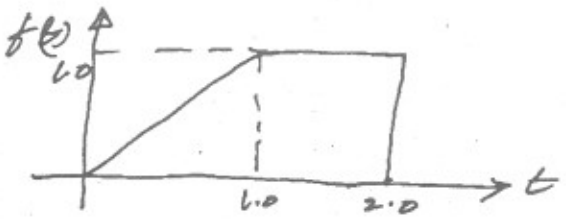
(A) reaches infinity at poles and zero at zeros

(B) reaches zero at poles and infinity at zeros

(C) reaches zero at both poles and zeros

(D) reaches infinity at both poles and zeros

25. The Laplace transform of the function shown in figure is given by



(A) $\frac{1}{s^2} - \frac{e^{-s}}{s} - \frac{e^{-2s}}{s^2}$

(B) $\frac{1}{s^2}\left(1 - e^{-s} - e^{-2s}\right)$

(C) $\frac{1}{s}\left(1 - e^{s} - se^{-2s}\right)$

(D) $\frac{1}{s^2}\left(1 - e^{-s} - se^{-2s}\right)$

26. The state and output equations of a control system are given by

$$\dot{X} = AX + BU \text{ and } Y = CX + DU .$$

The transfer function relating the output 'Y' to the input 'U' is given by

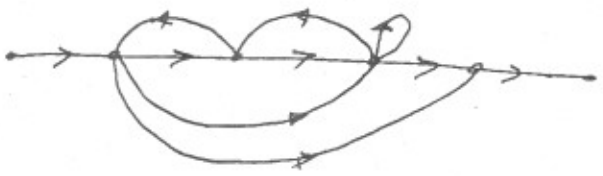
(A) $C\,(SI - A)^{-1}\,D$

(B) $C\,(SI - A)^{-1}\,B + D$

(C) $C\,(SI - A)^{-1}\,B$

(D) $CB\,(SI - A)^{-1} + D$

27. For the signal flow graph shown in figure the number of forward paths and the number of pairs of two non touching loops, are given by



(A) 3, 1 (B) 4, 0 (C) 3, 2 (D) 3, 0

28. The unit step input response of a certain control system is $C(t) = 0.5\left(1 - e^{-2t}\right)$. It is cascaded with another system whose impulse response is given by $h(t) = e^{-t}$. The transfer function of the cascaded system is

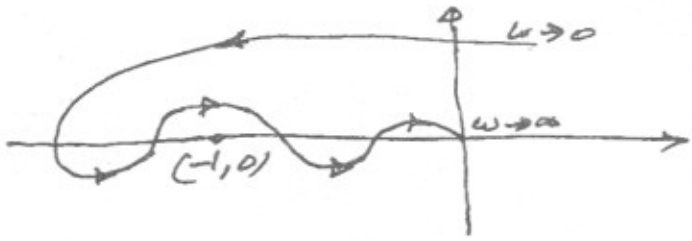
(A) $\frac{1}{s\,(s+2)}$

(B) $\frac{1}{(s+1)\,(s+2)}$

(C) $\frac{1}{(s+2)}$

(D) $\frac{s}{(s+1)\,(s+2)}$

29. The Nyquist plot of a open loop stable control system is shown in figure. The stability of the system is inferred as

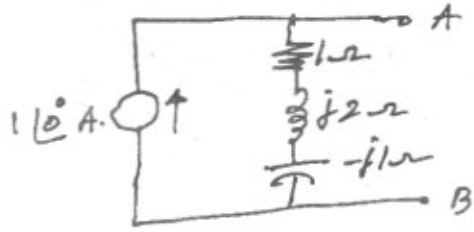


(A) unstable
(B) stable
(C) critically stable
(D) stability cannot be ascertained

30. The number of roots of the equation $2s^4 + s^3 + 3s^2 + 5s + 7 = 0$ that lie on the right half of 's' plane is

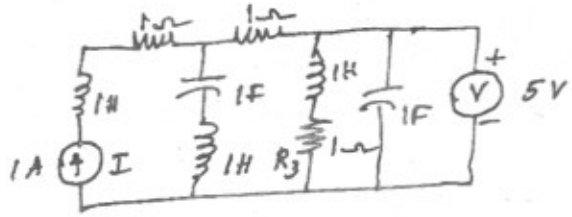
(A) 0 (B) 1 (C) 2 (D) 3

31. For the circuit shown in figure the Thevenin equivalent circuit at the terminals, AB is



(A) $\sqrt{2}\,(1 + j2)\,\Omega$
(B) $2\angle 45^\circ$ V, $(1 - j2)\,\Omega$
(C) $2\angle 45^\circ$, $(1 + j1)\,\Omega$
(D) $\sqrt{2}\angle 45^\circ$ V, $(1 + j1)\,\Omega$

32. For the circuit shown in figure, the currents through R_3 and the voltage source 'V' are respectively



(A) 1, 4 (B) 5, 1 (C) 5, 2 (D) 5, 4

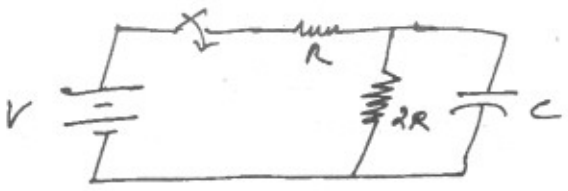
33. A 400 V, 50 Hz, three phase source, supplies a star connected load rated $12\sqrt{3}$ KVA, 0.8 pf lag. To improve the power factor to unity, the KVAR rating for the capacitor banks is

(A) 28.78 (B) 21.30 (C) 16.60 (D) 12.47

34. When a unit impulse voltage is applied to an inductor of 1 H, the energy supplied by the source is

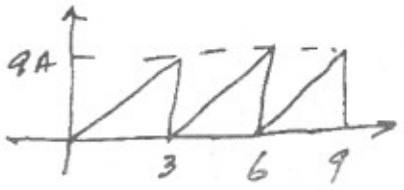
(A) 0 J (B) 1 J (C) 0.5 J (D) ∞ J

35. The time constant for the circuit shown in figure is



(A) $2\ RC$ (B) $3\ RC$ (C) $\frac{RC}{2}$ (D) $\frac{2}{3}\ RC$

36. The current waveform shown in figure is applied to a 10 Ω resistor. Power dissipated in the resistor is



(A) 7.29 W (B) 52.0 W (C) 135 W (D) 270 W

37. An electrical network has n-nodes and b-branches. Then the number of loop equations required to solve the network, is given by

(A) $n - b + 1$ (B) $b - n + 1$ (C) $b + n + 1$ (D) $b - n - 1$

38. The unit impulse response of a circuit is given by $C(t) = -4e^{-t} + 6e^{-2t}$. Then the unit step response of the system will be

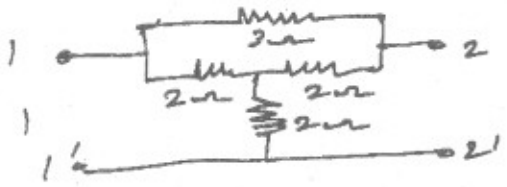
(A) $-3e^{-2t} + 4e^{-t} + 1$ (B) $-3e^{-2t} + 4e^{-t} - 1$

(C) $-3e^{-2t} - 4e^{-t} - 1$ (D) $3e^{-2t} + 4e^{-t} + 1$

39. The Z-transform of the function $f(nT) = a^{nT}$ is

(A) $\frac{Z}{Z - a^{T}}$ (B) $\frac{Z}{Z + a^{T}}$ (C) $\frac{Z}{Z - a^{-T}}$ (D) $\frac{Z}{Z + a^{-T}}$

40. The Z_{12} – parameter for the circuit shown in figure is



(A) 6Ω (B) 3Ω (C) 2Ω (D) 1Ω

41. In a thyristor, the holding current I_h and latching current I_L are related as

(A) $I_h = I_L$ (B) $I_h < I_L$

(C) $I_h > I_L$ (D) I_h has no relation to I_L

42. The turn on time of an SCR can be reduced by using

(A) a triangular pulse

(B) a trapezoidal pulse

(C) a rectangular pulse of high amplitude and low width

(D) a rectangular pulse of low amplitude and high width

43. Choose the correct statement :

(A) Both MOSFET and BJT are voltage controlled devices

(B) Both MOSFET and BJT are current controlled devices

(C) MOSFET is current controlled and BJT is voltage controlled

(D) MOSFET is voltage controlled and BJT is current controlled

44. In a BJT, the relationship between α and β is given by

(A) $\beta = \frac{\alpha}{1+\alpha}$ (B) $\beta = \frac{\alpha}{\alpha-1}$ (C) $\alpha = \frac{\beta}{\beta-1}$ (D) $\alpha = \frac{1+\beta}{\beta}$

45. An SCR can withstand a maximum junction temperature of 120°C, at an ambient of 45°C. Thermal resistance of the SCR from junction to ambient is 1.5°C/watt. The maximum internal power dissipation in watts is

(A) 80 (B) 60 (C) 50 (D) 30

46. The device which is smaller in size and cheaper, that can be used for high frequency applications, is given by

(A) SCR (B) TRIAC (C) GTO (D) MOSFET

47. Most reliable, efficient and commonly employed method for triggering of SCR's is

(A) dv/dt triggering (B) Gate triggering

(C) forward voltage triggering (D) light triggering

48. In a single phase full converter, the peak and average values of output voltages are 325 V and 133 V respectively. Then the firing angle will be

(A) 40° (B) 50° (C) 130° (D) 140°

49. A step down chopper has a load resistance of 10 ohms, input voltage of 250 V, a chopping frequency of 1 KHZ and a duty cycle of 40%. Then the output power will be

(A) 3750 W (B) 3250 W (C) 2500 W (D) 1750 W

50. Match List 1 and List 2 and give the correct answer using the codes given below :

List 1 – Devices	List 2 – Properties
1. TRIAC	(a) Voltage driven device
2. MOSFET	(b) Five layer device
3. GTO	(c) Switching speed of 100 khz
4. 1 GBT	(d) High gate drive losses

(A) 1 — (b), 2 — (a), 3 — (d), 4 — (c)

(B) 1 — (a), 2 — (d), 3 — (d), 4 — (c)

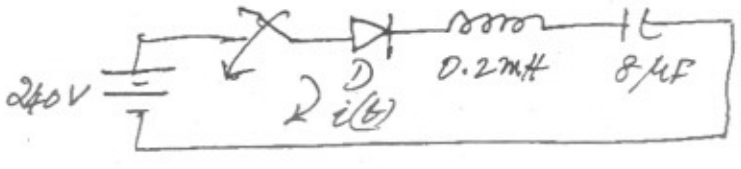
(C) 1 — (d), 2 — (c), 3 — (a), 4 — (b)

(D) 1 — (c), 2 — (d), 3 — (b), 4 — (d)

51. For a 3 phase, six pulse, diode rectifier, the average output voltage in terms of the maximum supply line voltage is given by

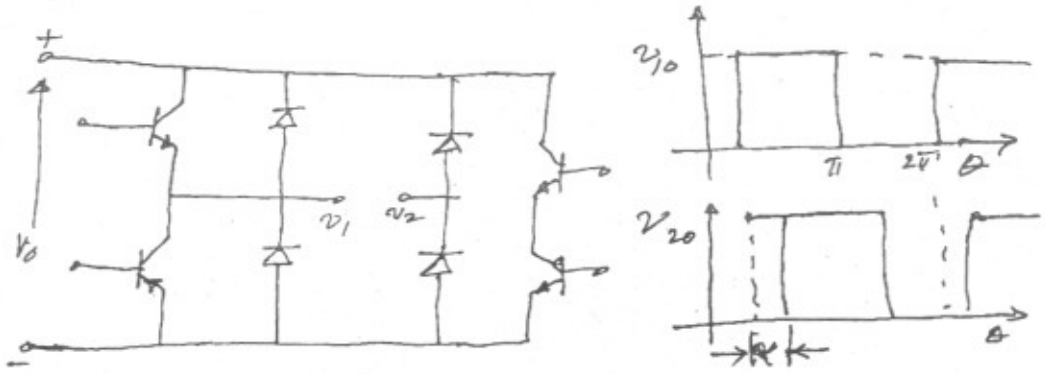
(A) $\frac{3\sqrt{2}}{\pi} V_m$ (B) $\frac{3V_m}{\pi}$ (C) $\frac{3\sqrt{3}}{2\pi} V_m$ (D) $\frac{3\sqrt{3}}{\pi} V_m$

52. In the circuit shown in figure, the maximum value of the current through the diode is



(A) 24 A (B) 36 A (C) 48 A (D) 60 A

53. For the inverter shown in figure the voltage waveforms v_{10} and v_{20} are given along side. What is the rms voltage between terminal 1 and 2 i.e. v_{12}?

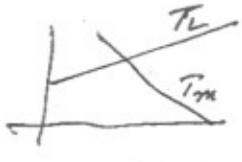


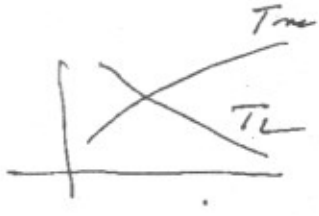
(A) $\frac{V_s \alpha}{\sqrt{2}\pi}$ (B) $Vs \cdot \sqrt{\alpha/\pi}$ (C) $Vs \sqrt{\frac{\alpha}{2\pi}}$ (D) $Vs \cdot \frac{\alpha}{\sqrt{\pi}}$

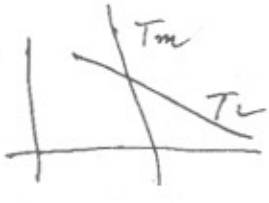
54. In a single pulse modulation of PWM inverter, the third harmonic in the output voltage may be eliminated, if the pulse width is equal to

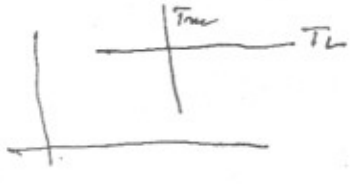
(A) 30° (B) 60° (C) 120° (D) 150°

55. The load and motor torque characteristics are given below. The typical example for unstable system is

(A) 

(B) 

(C) 

(D) 

56. For low speed, high power reversible drive, the most suitable drive

(A) cyclo-converter fed a.c. drive

(B) current source inverter fed ac drive

(C) voltage source inverter fed ac drive

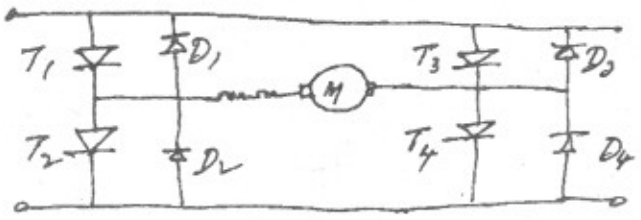
(D) a.c. voltage controller fed induction motor.

57. In a power controller, firing angle α, extinction angle β and conduction angle, γ are related by

(A) $\alpha = \beta + \gamma$ (B) $\beta = \gamma - \alpha$

(C) $\gamma = \beta - \alpha$ (D) $\alpha + \beta + \gamma = 0$

58. For the four quadrant d.c. chopper shown in figure, for reverse motoring, which SCR is to be operated?



(A) T_1 (B) T_2 (C) T_3 (D) T_4

59. If the half cycle surge current rating of an SCR is 6000 t at 50 Hz supply, then the one cycle surge current rating will be

(A) 3000 A (B) 4242 A (C) 6000 A (D) $\sqrt{2} \times 6000\ t$

60. In a dual converter operation, the circulating current will be zero if the firing angle of the first converter is

(A) 45° (B) 60° (C) 75° (D) 90°

61. The equation that represents the Gauss law in a homogeneous isotropic medium is

(A) $\int D \cdot ds = \iint \rho\ dA$ (B) $\nabla \times H = D$

(C) $\nabla \cdot J + \rho = 0$ (D) $\nabla \cdot E = \rho/\varepsilon$

62. A metal sphere 1 m radius having a surface charge density of 10 C/m^2, is enclosed in a cube of 10 m side. The total outward electric displacement in coulombs, normal to the surface of the cube is

(A) $40\ \pi$ (B) 10 (C) $10/\pi$ (D) 2

63. Two point charges $+Q$ and $-Q$ are placed at the two opposite corners of a square. If the potential at the other corner is 1 V, then the potential at the centre of the square is

(A) 0 (B) $\frac{1}{\sqrt{2}}$ V (C) 1 V (D) $\sqrt{2}$ V

64. The energy stored in the magnetic field of a solenoid 30 cm long and 3.0 cm diameter, wound with 100 turns of wire, carrying a current of 10 A is

(A) 0.015 J (B) 0.15 J (C) 0.5 J (D) 1.15 J

65. A plane electromagnetic wave travelling along + Z-direction has its electric field $E_x = 2 \cos t$ and $E_y = \cos(t + 9\ i)$. The wave is

(A) linearly polarized (B) right circularly polarized

(C) left circularly polarized (D) elliptically polarized

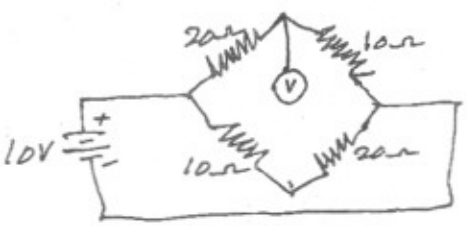
66. The total flux coming out of a cylinder placed in a uniform magnetic field is

(A) 0 (B) 1 Wb (C) 2 Wb (D) 5 Wb

67. The meter constant of a single phase 240 V, induction type energy meter is 400 revolutions per kwh. When a current of 10 A at 0.8 pf lag, flows, the speed of the meter disc will be

(A) 12.8 rpm (B) 16.02 rpm (C) 18.2 rpm (D) 26.1 rpm

68. For the bridge shown in figure the reading of the high impedance voltmeter is



(A) 0 (B) 6.66 V (C) 4.2 V (D) 3.33 V

69. Wheatstone bridge method is ideally suited for the measurement of resistances in the range of

(A) 0.001 to 1.0 ohm (B) 0.1 to 100 ohms

(C) 100 to 10 k-ohms (D) 100 K to 10 M-ohms

70. A 2000 Ω, voltmeter consumes 2.0 mw, when connected to a d.c. source. If a 4000 Ω, voltmeter is connected to the same circuit, the power consumption will be

(A) 4.0 mw (B) 1.0 mw (C) 2.0 mw (D) 0.5 mw

71. The Q factor of a coil at a resonant frequency of 1.5 MHz of an RLC series circuit is 150. Then the bandwidth is

(A) 225 MHz (B) 1.06 MHz (C) 10 kHz (D) 0.001 MHz

72. A 150 V moving iron voltmeter with class 1 accuracy reads 75 V, when used in a circuit under standard conditions. The maximum possible percentage error in the reading is

(A) 0.5 (B) 1.0 (C) 2.0 (D) 4.0

73. Four ammeters have the full scale value and % accuracy as given below :

$M_1 \rightarrow 20 \pm 0.1$, $M_2 \rightarrow 10 \pm 0.2$

$M_3 \rightarrow 5 \pm 0.5$, $M_4 \rightarrow 1 \pm 1.0$

A current of 1 A is to be measured with minimum error in the reading. The meter to be selected is

(A) M_1 (B) M_2 (C) M_3 (D) M_4

74. To measure a signal of 10 mV at 75 MHz the meter to be used is

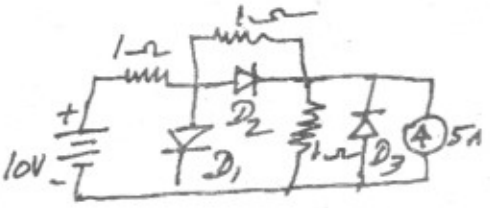
(A) VTVM (B) CRO

(C) MI voltmeter (D) Digital multimeter

75. How many base circuits does a dual trace CRO, has?

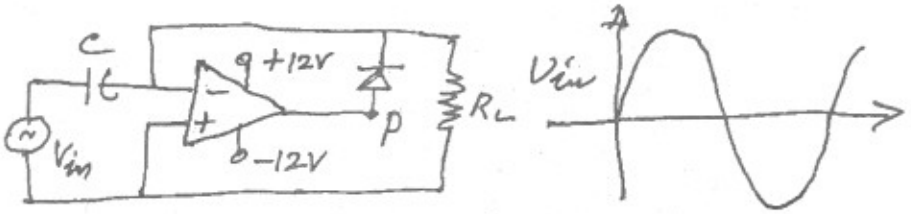
(A) 1 (B) 2 (C) 3 (D) 4

76. The states of the diodes shown in figure are

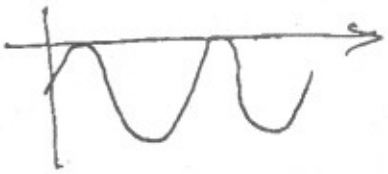


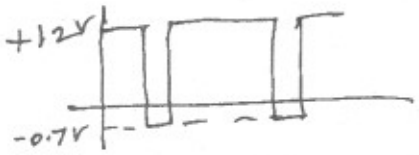
	D_1	D_2	D_3
(A)	ON	OFF	OFF
(B)	OFF	ON	OFF
(C)	ON	OFF	ON
(D)	OFF	ON	ON

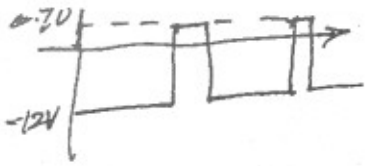
77. For the clamper circuit shown in figure the waveform of voltage at point P, for sinusoidal input voltage will be



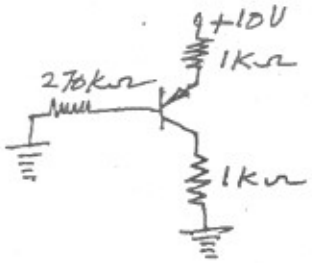
(A) 

(B) 

(C) 

(D) 

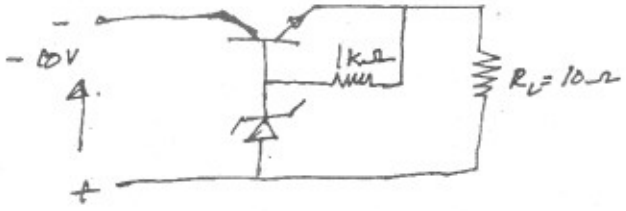
78. The common emitter forward current given for the transistor shown in figure is 100. Then the transistor operates in



(A) saturation region (B) cut off region

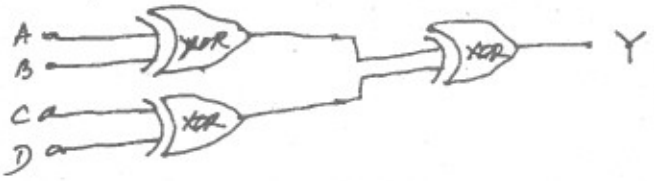
(C) reverse active region (D) forward active region

79. What is the power dissipated in the transistor of the voltage regulator shown in figure?



(A) 0.6 w (B) 2.4 w (C) 4.2 w (D) 5.4 w

80. In the XOR gate circuit shown in figure A, B, C, D are inputs and Y is the output. Then nature of the sum, s and output Y is



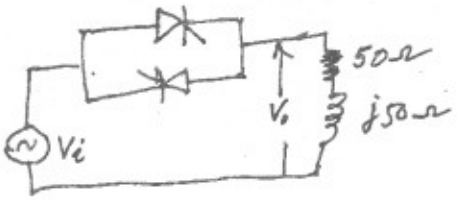
(A) s is always either zero or odd

(B) s is always either zero or even

(C) $s = 1$, only if the sum of inputs is even

(D) $s = 1$ only if the sum of the input is odd

81. For what range of triggering angle (α) the output voltage is not controllable for the circuit shown in figure.



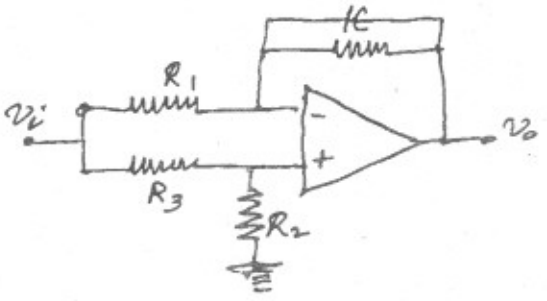
(A) $0 < \alpha < 45^\circ$

(B) $45^\circ < \alpha < 135^\circ$

(C) $90^\circ < \alpha < 180^\circ$

(D) $135^\circ < \alpha < 180^\circ$

82. For the circuit shown in figure $R_1 = R_2$ and $R_3 = R_4$. Then the circuit acts as a



(A) all pass filter

(B) band pass filter

(C) high pass filter

(D) low pass filter

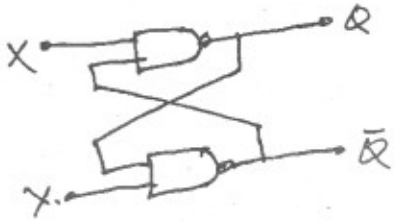
83. An amplifier has a overall current gain of 100 and an input resistance of 10 kΩ. If the load resistance is 1 kΩ, the overall voltage gain will be

(A) 5 (B) 10 (C) 20 (D) 40

84. An op-amp has a common mode gain of 0.01 and a differential mode gain of 10^5. Then the common mode rejection ratio will be

(A) 10^{-7} (B) 10^{-3} (C) 10^3 (D) 10^7

85. For the flip-flop circuit shown in figure the non stable state corresponds to



(A) $X = 0, Y = 0$ (B) $X = 0, Y = 1$

(C) $X = 1, Y = 0$ (D) $X = 1, Y = 1$

86. A 300 KVA transformer has 95% efficiency at full load, 0.8 pf lag and 96% efficiency at half load, upf. Then the maximum efficiency at upf will be

(A) 95.1% (B) 96.2% (C) 96.4% (D) 98.1%

87. In a transformer, zero voltage regulation at full load is

(A) not possible (B) possible at upf load

(C) possible at leading pf load (D) possible at logging pf load

88. A d.c. motor, which can provide zero speed regulation at full load, without any controller is a

(A) series motor (B) shunt motor

(C) cumulative compound motor (D) differential compound motor

89. The total reactance and suceptance of a lossless EHV line of 50 Hz are 0.045 and 1.2 p.u. respectively. The velocity of wave propagation is 3×10^5 KM/sec. The approximate length of the line will be

(A) 122 km (B) 185 km (C) 222 km (D) 272 km

90. A 3 phase cage induction motor has a starting current of seven times the full current. The full load slip is 5%. A star-delta starter is used to start the motor. The p.u. starting torque will be

(A) 0.607 (B) 0.816 (C) 1.225 (D) 1.816

91. The characteristic equation of a 3 × 3 matrix, P is given by $\alpha(\lambda) = \lambda^3 + \lambda^2 + 2\lambda + 1 = 0$. If I is the identity matrix, then the inverse of matrix P is given by

(A) $(P^2 + P + 2I)$ (B) $(P^2 + P + I)$

(C) $-(P^2 + P + I)$ (D) $-(P^2 + P + 2I)$

92. In a stepper motor, the detent torque means

(A) minimum of the static torque, when excited

(B) maximum of the static torque, when excited

(C) minimum of the static torque, when not excited

(D) maximum of the static torque, when not excited

93. A 400 V, 50 Hz, 22.5 kW, 3 phase induction motor draws a current of 50 A of 0.8 pf lag. The stator copper losses are 1.5 kW and that of rotor 900 W. The core losses are 1.2 kW and windage and friction losses are 1.05 kW. Then the air gap power of the motor will be

(A) 23 kW (B) 24 kW (C) 25 kW (D) 26 kW

94. A 3 phase, 440-V, 50 Hz, 4 pole, step ring induction motor is fed from the rotor side through an auto transformer and the stator is connected to a variable resistance. The motor runs at 1410 rpm. The speed of rotation of the stator magnetic flux with respect to the rotor will be

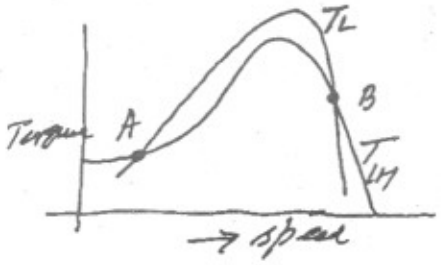
(A) 90 rpm in the direction of rotation

(B) 90 rpm in the opposite direction of rotation

(C) 1500 rpm in the direction of rotation

(D) 1500 rpm in the opposite direction of rotation

95. The speed-torque characteristics of a 3 phase cage induction motor and the load are shown in fig. Which is the correct description of the equilibrium points A and B?



(A) A is stable of B is unstable

(B) A is unstable of B is stable

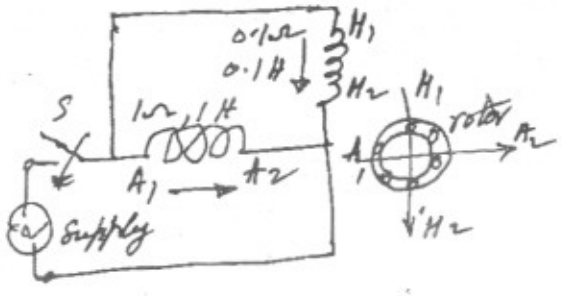
(C) Both A and B are stable

(D) Both A and B are unstable

96. A single phase iron core transformer has both the horizontal cores of cross sectional area 10 cm^2 and the two vertical cores of 20 cm^2. The two windings are on the vertical cones. The mutual inductance is L. If the two windings are wound on the horizontal core arms, the mutual inductance will become

(A) $2L$ (B) L (C) $\frac{L}{2}$ (D) $\frac{L}{4}$

97. A 220 V, 50 H, single phase motor with $M_1 M_2$ as the main stator winding and $A_1 A_2$ as the auxiliary winding with flux directions, is shown in Fig. The direction of rotation of the rotor will be



(A) clockwise

(B) anticlockwise

(C) no rotation possible

(D) rotates momentarily and comes to a stop

98. For the ideal transformer shown in Fig. The input source current is 10 $\sin 314t$. The magnetizing inductance is $400/\pi$ mH. What is the load voltage?

(A) $400/\sqrt{2}$ (B) $320/\sqrt{2}$

(C) $240/\sqrt{2}$ (D) $160/\sqrt{2}$

99. An 8085 micro processor based system uses a 4 KX8 bit RAM, whose starting address is AAOOH. The address of the last byte in this RAM will be

(A) OFFFH (B) 1000 H

(C) B9FFH (D) BAOOH

100. A 3300 V, 3 phase star connected synchronous motor has a synchronous impedance of (0.4 + j 5) ohms per phase. For an excitation emf of 4000 V and motor input of 1000 kW, the line current will be

(A) 184.5 A (B) 144.5 A

(C) 154.5 A (D) 164.6 A