LT-2023 Booklet No. 32722

WRITTEN TEST

For Selection to the Post of

Lecturer (Technical) in Electrical Engineering

Under Higher Education (Technical) Department, Government of Assam

Series Code **C**

Time : 9:30 AM to 12:00 NOON

QUESTION BOOKLET

INSTRUCTIONS

1. Answer the Questions in the **OMR Answer Sheet** Provided.
2. **Do not Fold/staple the OMR Answer Sheet.**
3. Open the Booklet after the Bell rings at 9:30 A.M.
4. **Write and darken your Roll Number** carefully in the OMR Sheet Side-I.
5. **Darken the Correct Answer/most suitable Answer in the OMR Answer Sheet using BLACK BALL PEN.**
6. **Please darken the correct option as shown below :**

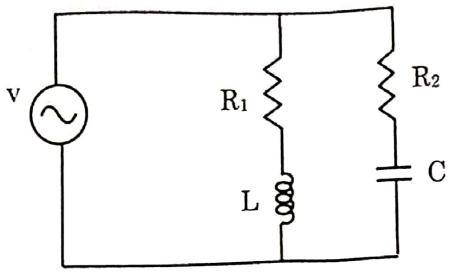
   Correct : ● ○ ○ ○ Incorrect : ⊗ ⊘ ⊜ ◒

7. **Write and darken your Question Booklet Series Code [A/B/C/D]** carefully in the OMR Answer Sheet.
8. There are altogether **75 Questions and 36 pages** in the Question Booklet.
9. All Questions are Multiple Choice type Questions (MCQ).
10. **Please check the total number of Questions and Page Numbers of the Question Booklet. In case of discrepancy in this regard, please inform the Invigilator for replacement of the Question Booklet.**
11. **One (1) Mark will be awarded for every Correct Answer and for every Wrong Answer, one-fourth (0.25) mark will be deducted.**
12. No candidate will be allowed to leave the Examination Hall temporarily during the Examinations.
13. No candidate can leave the designated seat of the Examination Hall till the end of the examination.
14. **Candidates need to maintain discipline before, during and after the examination.**
15. **Use of Calculators, Cell Phones (mobiles) and other Electronic Gadgets, cameras are strictly prohibited inside the Examination Hall.**
16. The blank spaces and blank sheets attached at the end of the Question Booklet are to be used for rough calculations only.
17. You will be asked by the Invigilator to put your signature and your Left Hand Thumb Impression on the Attendance Sheet & OMR Answer Sheet. Please sign the Attendance Sheet and OMR Answer Sheet in the same way as you signed and uploaded during Online Application which is appearing in your Admit Card.
18. Please submit the OMR Answer Sheet to the Invigilator before leaving the examination hall.
19. Candidature of any candidate will be cancelled if he/she does not follow the guidelines and instructions and if he/she is found to adopt unfair means, in any form as noted by the invigilator/authority.

(TURN THIS PAGE WHEN THE BELL RINGS AT 9:30 A.M.)

LECTURER (TECHNICAL)
ELECTRICAL ENGINEERING

1. The condition that the currents in the two branches of the circuit shown in figure below shall remain in quadrature when R_1 and R_2 are varied simultaneously



Ⓐ $(R_1 / R_2) = (L / C)$

Ⓑ $(R_1 R_2) = (L / C)$

Ⓒ $(R_1 R_2) = (LC)$

Ⓓ $(R_1 / R_2) = (LC)$

2. The state variable description of an LTI system is given by

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & a_1 & 0 \\ 0 & 0 & a_2 \\ a_3 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \quad y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

where y is the output and u is the input. The system is controllable for

Ⓐ $a_1 \neq 0, a_2 = 0, a_3 \neq 0$

Ⓑ $a_1 = 0, a_2 \neq 0, a_3 \neq 0$

Ⓒ $a_1 = 0, a_2 \neq 0, a_3 = 0$

Ⓓ $a_1 \neq 0, a_2 \neq 0, a_3 = 0$

3. A state variable system with the initial condition $X(0) = [-1 \ \ 3]^T$ and the unit step input $u(t)$, $\dot{X}(t) = \begin{bmatrix} 0 & 1 \\ 0 & -3 \end{bmatrix} X(t) + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u(t)$. The state transition matrix is

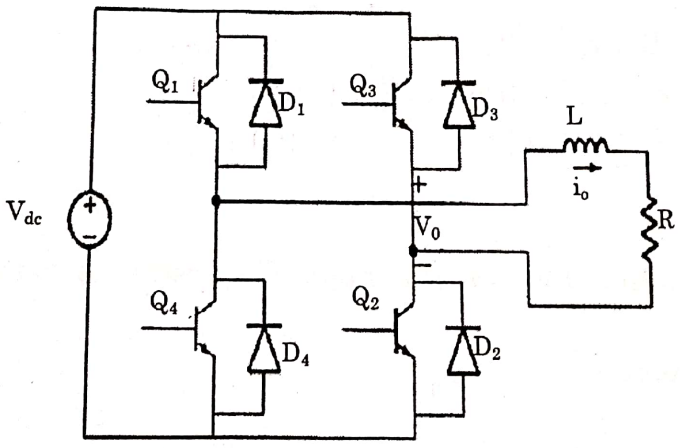
Ⓐ $\begin{bmatrix} 1 & \frac{1}{3}(1-e^{-3t}) \\ 0 & e^{-3t} \end{bmatrix}$

Ⓑ $\begin{bmatrix} 1 & \frac{1}{3}(e^{-t}-e^{-3t}) \\ 0 & e^{-t} \end{bmatrix}$

Ⓒ $\begin{bmatrix} 1 & \frac{1}{3}(e^{3-t}-e^{-3t}) \\ 0 & e^{-3t} \end{bmatrix}$

Ⓓ $\begin{bmatrix} 1 & (1-e^{-t}) \\ 0 & e^{-t} \end{bmatrix}$

4. The Voltage Source Inverter (VSI) shown in the figure below is switched to provide a 50 Hz, square wave ac output voltage V_0 across an RL load. Reference polarity of V_o and reference direction of the output current i_o are indicated in the figure. It is given that R = 3 ohms, L = 9.55 mH. In the interval when $V_o < 0$ and $i_o > 0$ the pair of devices which conducts the load current is



Ⓐ Q_1, Q_2

Ⓑ Q_3, Q_4

Ⓒ D_1, D_2

Ⓓ D_3, D_4

5. The brush-axis of a bipolar dc motor is rotated by 90°. The effect of this rotation on the back emf E_b and the torque developed T_d would be such that

Ⓐ both E_b and T_d are unchanged

Ⓑ E_b is zero, but T_d is unchanged

Ⓒ E_b is unchanged, but T_d is zero

Ⓓ both E_b and T_d are zero

6. A 10 KV A, 2500 / 250 V, single phase transformer gave the following results

OC test: 250 V, 0.8 A, 50 W

SC Test: 60 V, 3 A, 45 W

The maximum % efficiency of the transformer at 0.8 power factor lag is

Ⓐ 97.2

Ⓑ 96.2

Ⓒ 98.44

Ⓓ 95.44

7. A 220 V dc machine has an armature resistance of 1 Ω. If the armature current is 20 A, the difference in the induced voltages when the machine is running as a motor and as a generator is

Ⓐ 20 V

Ⓑ 0 V

Ⓒ 40 V

Ⓓ 50 V

8. Assume power factor of 0.8 lag at all loads. A 200 KVA transformer has an efficiency of 98 % at full load. If the maximum efficiency occurs at ¾ of full load, the % efficiency at half full load is

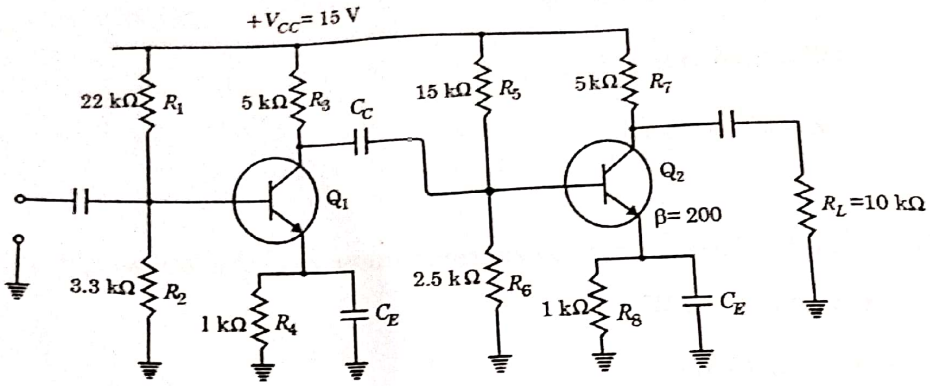
Ⓐ 98.26

Ⓑ 96.22

Ⓒ 95.34

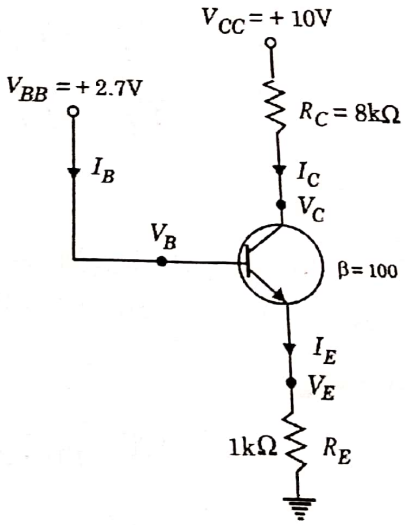
Ⓓ 97.92

9. Figure below shows a 2-stage RC coupled amplifier. Find the overall voltage gain



Ⓐ 53
Ⓑ 10144
Ⓒ 3452
Ⓓ 192

10. The transistor shown in figure below is operating in



Ⓐ Saturation region
Ⓑ Cutoff region
Ⓒ Reverse active region
Ⓓ Forward active region

11. The force in kg/m length between two wires carrying current in the same direction of 3A and 6A are placed with their axes 5 cm apart, free space permeability= $4\pi \times 10^{-7}$ H/m is

Ⓐ 72

Ⓑ 7.3469×10^{-6}

Ⓒ 7.3469×10^{6}

Ⓓ 32

12. Which of the following is the point form of continuity equation of the current?

Ⓐ $\nabla . \bar{J} = -\frac{\partial \rho_v}{\partial t}$

Ⓑ $\nabla . \bar{J} = -\frac{\partial \rho_L}{\partial t}$

Ⓒ $\nabla x \bar{J} = -\frac{\partial \rho_v}{\partial t}$

Ⓓ $\nabla x \bar{J} = -\frac{\partial \rho_L}{\partial t}$

13. An energy meter is designed to make 100 revolutions of disc for one unit of energy. The number revolutions made by it when connected to load carrying 40A at 230V and 0.4 power factor for an hour is

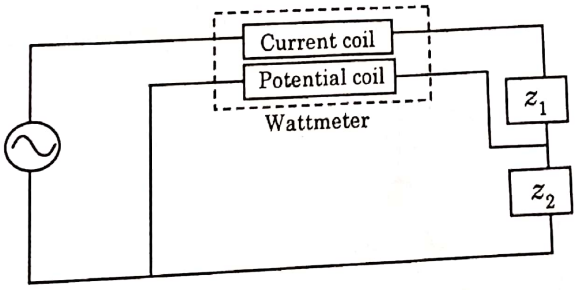
Ⓐ 350

Ⓑ 360

Ⓒ 368

Ⓓ 358

14. A wattmeter is connected as shown in the figure. The wattmeter reads



Ⓐ Zero always

Ⓑ Total power consumed by Z_1 and Z_2

Ⓒ Power consumed by Z_1

Ⓓ Power consumed by Z_2

C

15. Consider two buses connected by an impedence of $(0+5j)\Omega$. The bus '1' voltage is $100\angle 30^\circ$ V, and bus '2' voltage is $100\angle 0^\circ$ V. The real and reactive power supplied by bus '1' respectively are

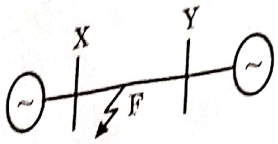
(A) 1000 W, 268 VAr

(B) −1000W, −134 Var

(C) 276.9 W, −56.7 VAr

(D) −276.9 W, 56.7 Var

16. A two machine power system is shown below. The transmission line XY has positive sequence impedance of $Z_1\Omega$ and zero sequence impedance of $Z_0\Omega$



An 'a' phase to ground fault with zero fault impedance occurs at the centre of the transmission line. Bus voltage at X and line current from X to F for the phase 'a', are given by V_a Volts and I_a amperes, respectively. Then, the impedance measured by the ground distance relay located at the terminal X of line XY will be given by

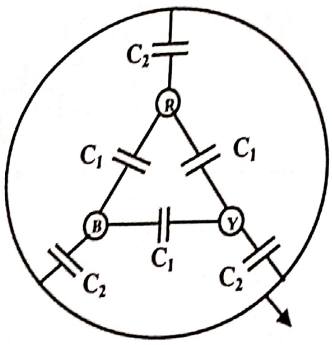
(A) $(Z_1/2)\Omega$

(B) $(Z_0/2)\Omega$

(C) $(Z_0+Z_1)/2\Omega$

(D) $(V_a/I_a)\Omega$

17. Consider a three-core, three-phase, 50 Hz, 11 kV cable whose conductors are denoted as R, Y and B in the figure. The inter-phase capacitance (C_1) between each line conductor and the sheath is 0.4 μF. The per-phase charging current is



(A) 2A

(B) 2.4A

(C) 2.7 A

(D) 3.5 A

18. The following program is written for an 8085 microprocessor to add two bytes located at memory addresses 1FFE and 1FFF

```
LXI     H, 1FFE
MOV     B, M
INR     L
MOV     A, M
ADD     B
INR     L
MOV     M, A
XOR     A
```

On completion of the execution of the program, the result of addition is found

(A) in the register A

(B) at the memory address 1000

(C) at the memory address 1F00

(D) at the memory address 2000

19. When a program is being executed in an 8085 microprocessor, its Program Counter contains

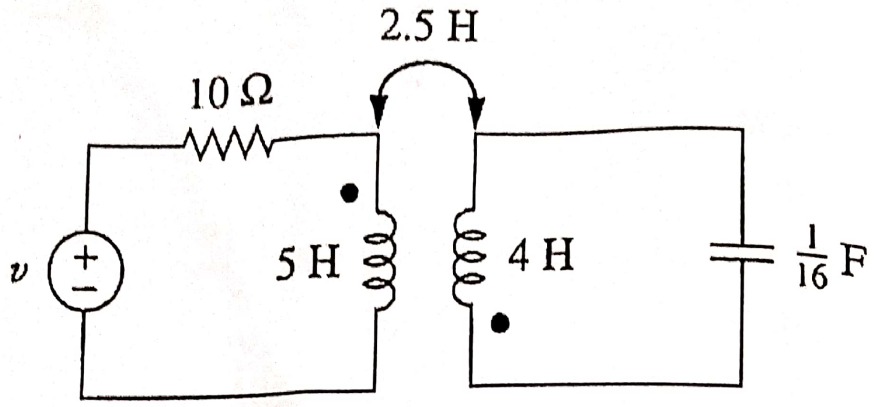
(A) the number of instructions in the current program that have already been executed

(B) the total number of instructions in the program being executed

(C) the memory address of the instruction that is being currently executed

(D) the memory address of the instruction that is to be executed next

20. For the circuit shown in figure below, calculate the energy stored in the coupled inductors at time $t = 1\,s$ if $v = 60\cos(4t + 30°)V$.



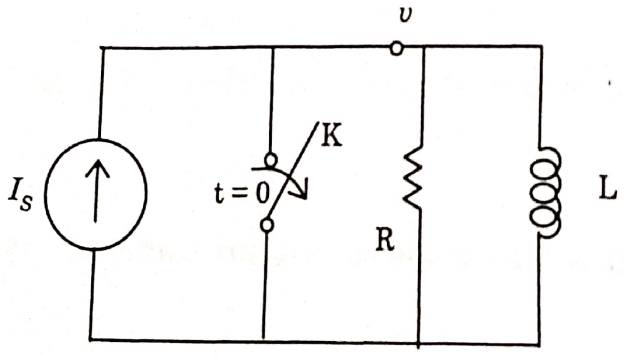
Ⓐ 20.73 J

Ⓑ 10.45 J

Ⓒ 45 J

Ⓓ 8.48 J

21. In the network shown in figure below, $I_s = 1A$, $R = 100$ ohm and $L = 1H$, the switch K is opened at $t = 0$, $\frac{dv}{dt}$ at $t = 0^+$ is



Ⓐ 10 V/s

Ⓑ −10 V/s

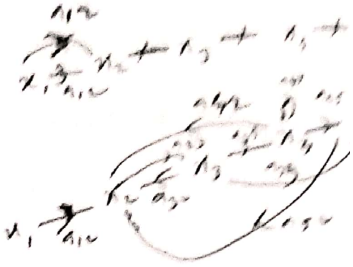
Ⓒ -10^4 V/s

Ⓓ 10^2 V/s

22. A system is defined by the following set of equations

$$x_2 = a_{12}x_1 + a_{32}x_3 + a_{42}x_4 + a_{52}x_5$$
$$x_3 = a_{23}x_2$$
$$x_5 = a_{35}x_3 + a_{45}x_4$$
$$x_4 = a_{34}x_3 + a_{44}x_4$$

From the signal flow graph, the number of forward paths is



Ⓐ 1

Ⓑ 2

Ⓒ 3

Ⓓ 4

23. The unity feedback system is characterised by an open loop transfer function $G(s) = \frac{K}{s(s+10)}$. The value of K to have a damping ratio of 0.5

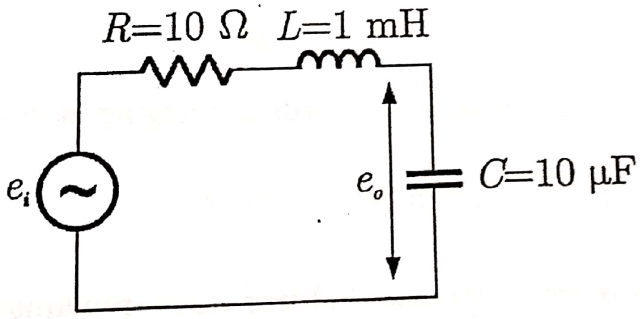
Ⓐ 10

Ⓑ 20

Ⓒ 30

Ⓓ 100

24. For a step-input, e_i, applied to the network shown in Figure below, the overshoot in the output e_o will be,



Ⓐ 0%

Ⓑ 5%

Ⓒ 16%

Ⓓ 48%

25. In induction motor, during the regenerative braking, the range of stable region of operation can be increased by

Ⓐ increasing frequency

Ⓑ increasing voltage

Ⓒ decreasing rotor resistance

Ⓓ increasing rotor resistance

26. A 220 V, 960 rpm, 80 A, separately excited DC motor has an armature resistance of 0.06 ohm. The motor is coupled to an overhauling load with a torque of 100 N-m. During regenerative braking the speed at which the motor can hold the load is

Ⓐ 945.2 rpm

Ⓑ 993.9 rpm

Ⓒ 1030.5 rpm

Ⓓ 1050 rpm

27. A high frequency induction furnace which takes 10 minutes to melt 1.815 Kg of aluminium, the input to the furnace being 5 KW and the initial temperature is 15°C. Specific heat of aluminium is 0.212, Melting point = 660° C, Latent heat of fusion of aluminium is 76.8 K Cal/Kg. The efficiency of furnace is

Ⓐ 54%

Ⓑ 78%

Ⓒ 68%

Ⓓ 45%

28. Which of the following statements regarding plugging in induction motor is false?

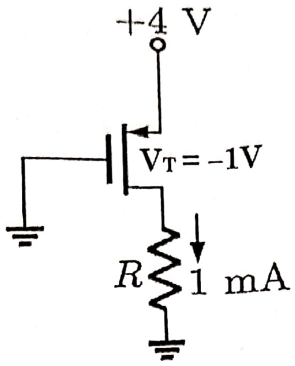
Ⓐ Best suitable for slip ring induction motor

Ⓑ copper losses in rotor increases but iron losses remains constant

Ⓒ Quickly stops the motor

Ⓓ Copper and iron losses increase in rotor

29. The value of R for which the PMOS transistor in figure below will be biased in linear region is



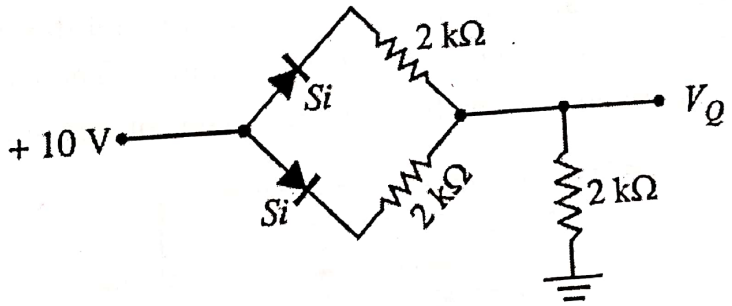
Ⓐ 220 Ω

Ⓑ 470 Ω

Ⓒ 680 Ω

Ⓓ 1200 Ω

30. Find V_Q in the network shown in figure below. Assume the diodes to be of silicon and forward resistance of diodes to be zero.



Ⓐ 6.2 V

Ⓑ 10 V

Ⓒ 3.4 V

Ⓓ 8 V

31. A communication channel is having a bandwidth of 3000 Hz. The transmitted power is such that the received Signal-to-Noise ratio is 1023. The maximum data rate that can be transmitted error-free through the channel is

Ⓐ 3 Kbps

Ⓑ 300 Kbps

Ⓒ 3 Mbps

Ⓓ 30 Kbps

32. Divergence of the vector field $V(x, y, z) = -(x\cos xy + y)\vec{i} + (y\cos xy)\vec{j} + (\sin Z^2 + X^2 + y^2)\vec{k}$ is

Ⓐ $2z\cos Z^2$

Ⓑ $\sin xy + 2z\cos Z^2$

Ⓒ $x\sin xy - \cos z$

Ⓓ $x\sin xy + \cos z$

33. If electric potential is given by, $V = \frac{60\sin\theta}{r^2}$ V. Then V at $P(3, 60, 25)$ is

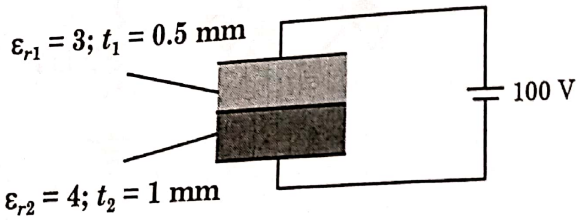
Ⓐ 6 V

Ⓑ 2.7735 V

Ⓒ 5.7735 V

Ⓓ 4 V

34. A composite parallel plate capacitor is made up of two different electric materials with different thickness (t_1 and t_2) as shown in figure. The two different dielectric materials are separated by a conducting foil F. The voltage of the conducting foil is



Ⓐ 52 V

Ⓑ 60 V

Ⓒ 67 V

Ⓓ 33 V

35. The line current in amperes in phases a, b and c respectively are 500+150j, 100-600j and 300+600j referred to the same reference vector. The symmetrical components of the current are

Ⓐ 100-j50, 546.3-165.46j, 48.8+21.82j

Ⓑ 546.3+165.46j, 48.8+21.82j, 100-50j

Ⓒ 100+j50, 546.3+165.46j, 48.8-21.82j

Ⓓ 546.3-165.46j, 48.8+21.82j, 100+50j

36. The reactance of a generator designated X" is given as 0.25 p.u. based on the generator's name plate rating of 18kV, 500 MVA. If the base for Calculations is changed to 20kV, 100MVA, the generator reactance X" on new base will be

Ⓐ 1.025 pu

Ⓑ 0.05 pu

Ⓒ 0.0405 pu

Ⓓ 0.25 pu

37. The bus admittance matrix of a power system is given as

$$\begin{bmatrix} -j50 & +j10 & +j5 \\ +j10 & -j30 & +j10 \\ +j5 & +j10 & -j25 \end{bmatrix}$$

The impedance of line between bus 2 and 3 will be equal to

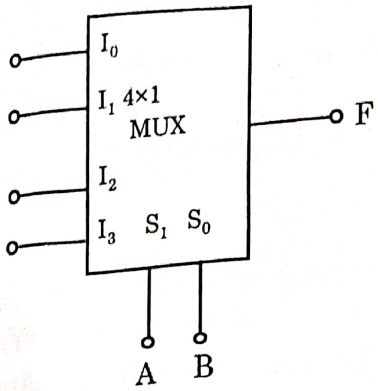
Ⓐ +j0.1

Ⓑ –j0.1

Ⓒ +j0.2

Ⓓ –j0.2

38. In the 4×1 multiplexer, the output F is given by $F = A \oplus B$, find the required input, I_3, I_2, I_1, I_0



Ⓐ 1, 0, 1, 0

Ⓑ 0, 1, 1, 0

Ⓒ 1, 0, 0, 0

Ⓓ 1, 1, 1, 0

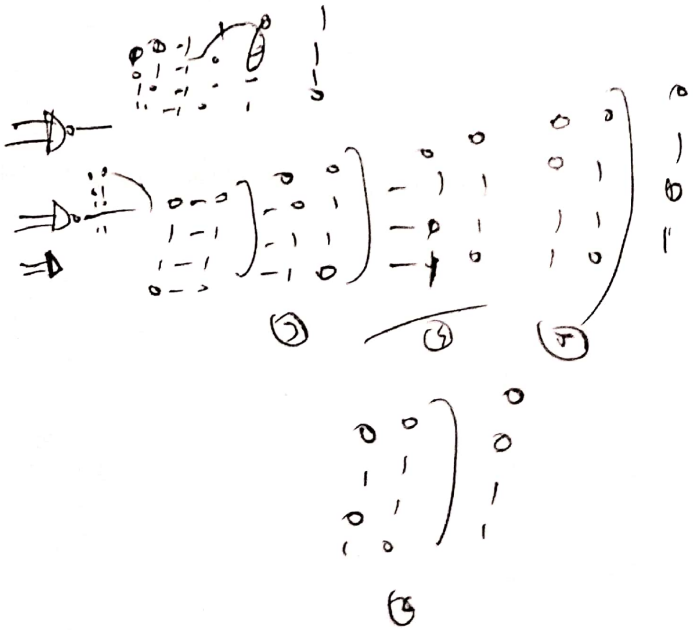
39. The minimum number of 2 input NAND gates required to implement a 2 input XOR gate is

Ⓐ 4

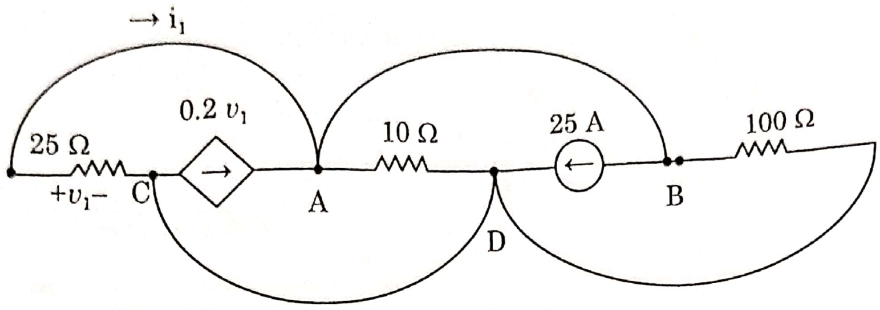
Ⓑ 5

Ⓒ 6

Ⓓ 7



40. For the circuit in figure below, the value of current i_1 is



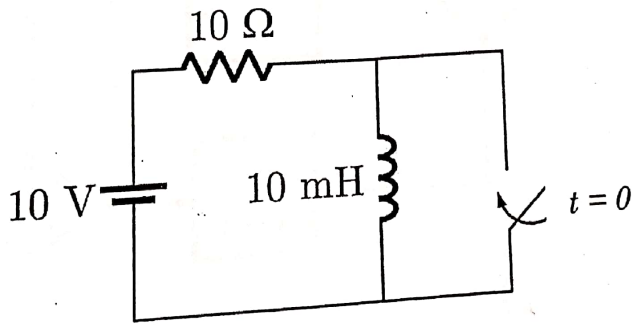
Ⓐ −0.5 A

Ⓑ −2 A

Ⓒ 3 A

Ⓓ −3 A

41. The circuit shown in the figure below is in steady state, when the switch is closed at $t = 0$. Assuming that the inductance is ideal, the current through the inductor at $t = 0^+$ equals



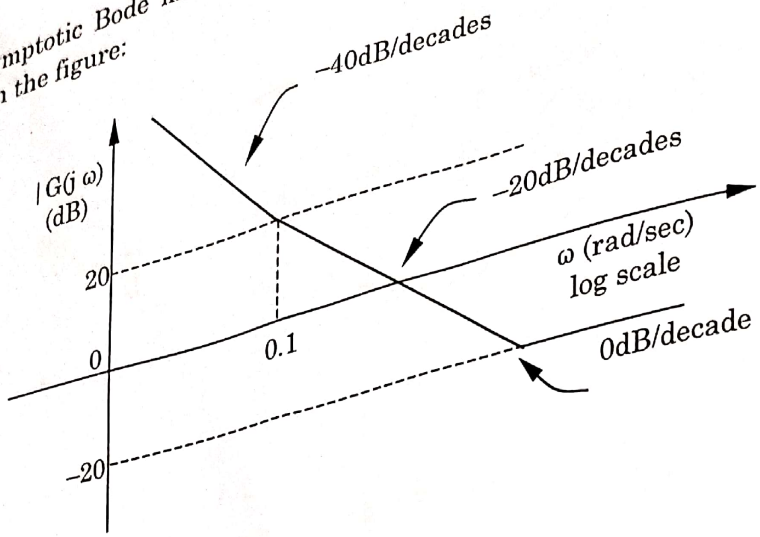
Ⓐ 0 A

Ⓑ 0.5 A

Ⓒ 1 A

Ⓓ 2 A

42. The asymptotic Bode magnitude plot of a minimum phase transfer function is shown in the figure:



This transfer function has

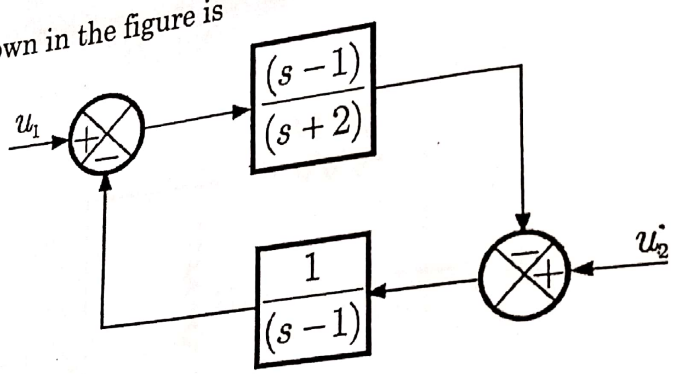
Ⓐ Three poles and one zero

Ⓑ Two poles and one zero

Ⓒ Two poles and two zeros

Ⓓ One pole and two zeros

43. The system shown in the figure is



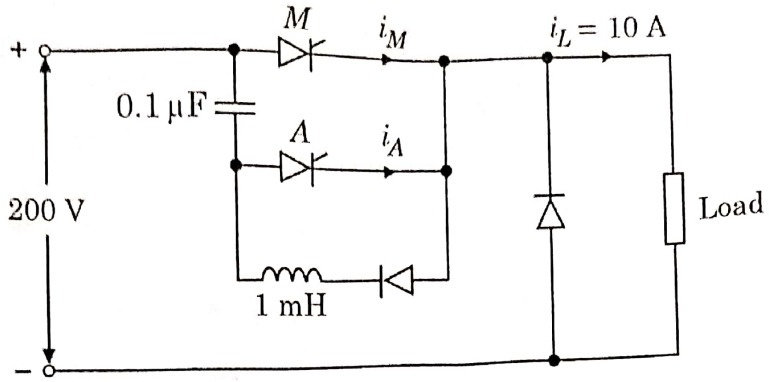
Ⓐ Stable

Ⓑ Unstable

Ⓒ Conditionally stable

Ⓓ Stable for input u_1 but unstable for input u_2

44. A voltage commutated chopper circuit, operated at 500 Hz, is shown below.



If the maximum value of load current is 10 A, then the maximum current through the main (M) and auxiliary [A] thyristors will be

(A) $i_{Mmax} = 12\,A$ and $i_{Amax} = 10\,A$

(B) $i_{Mmax} = 12\,A$ and $i_{Amax} = 2\,A$

(C) $i_{Mmax} = 10\,A$ and $i_{Amax} = 12\,A$

(D) $i_{Mmax} = 10\,A$ and $i_{Amax} = 8\,A$

45. Latching current for an SCR inserted in between a dc voltage source of 200 V and the load is 100 mA. The minimum width of gate pulse current required to turn on the SCR with a load of $R = 20$ ohm in series with $L = 2H$ is

(A) 1005.03 μs

(B) 200.85 μs

(C) 2045.48 μs

(D) 800.57 μs

46. A single-phase fully controlled thyristor bridge ac-dc converter is operating at a firing angle of 25° and an overlap angle of 10° ,with constant dc output current of 20 A. The power factor is

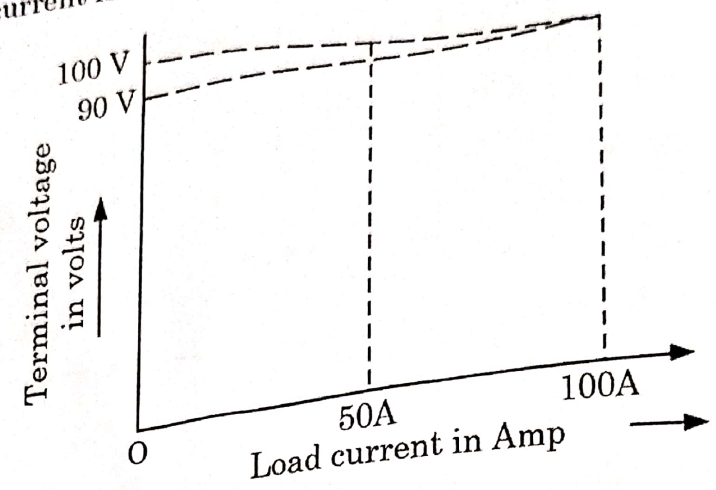
(A) 0.78

(B) 0.827

(C) 0.866

(D) 0.9

47. The external load characteristics of a dc generator at rated speed is assumed to be linear and is as shown in figure below. The load circuit comprises only resistance. When the load current is 50 A, the value of the load circuit resistance will be



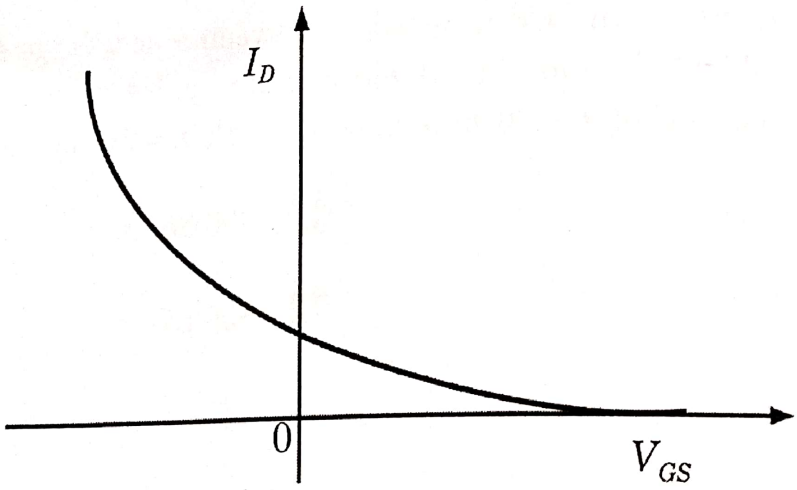
(A) 0.9 Ω

(B) 1 Ω

(C) 1.9 Ω

(D) 2 Ω

48. The variation of drain current with gate-to-source voltage (I_D - V_{GS} characteristic) o a MOSFET is shown in figure below. The MOSFET is



(A) an n-channel depletion mode device

(B) an n-channel enhancement mode device

(C) an p-channel depletion mode device

(D) an p-channel enhancement mode device

49. Soft iron is characterized by the saturation magnetization M_s, coercivity H_c and retentivity B_c it is suitable for electromagnetic because

Ⓐ M_s, H_c and B_c are small

Ⓑ M_s is small, H_c and B_c are large

Ⓒ M_s is large, H_c and B_c are small

Ⓓ M_s, H_c and B_c are large

50. Match the following:

(a)	Porcelain	1.	Used for high-frequency applications
(b)	Steatite	2.	Used in capacitors as dielectric
(c)	Mica	3.	Used for insulators
(d)	Rutile	4.	Releases water when heated

Ⓐ a-3, b-4, c-2, d-1

Ⓑ a-1, b-2, c-4, d-3

Ⓒ a-3, b-1, c-4, d-2

Ⓓ a-1, b-4, c-2, d-3

51. If the Fourier transform of $g(t)$ is $G(\omega)$, then match the following and choose right answer

(a)	The Fourier transform of $g(t-2)$ is	1.	$G(\omega)e^{-j2\omega}$
(b)	The Fourier transform of $g(t/2)$ is	2.	$G(2\omega)$
		3.	$2G(2\omega)$
		4.	$G(\omega-2)$

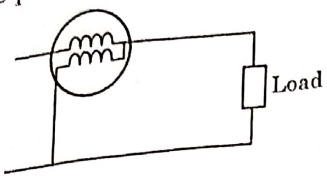
Ⓐ a-2, b-1

Ⓑ a-1, b-3

Ⓒ a-4, b-3

Ⓓ a-3, b-1

52. The coils of a wattmeter have resistances 0.01Ω and 1000Ω; their inductance may be neglected. The wattmeter is connected as shown in figure, to measure the power consumer by a load, which draws 25A at power factor 0.8. The voltage across the load terminals is 30V. The percentage error on the wattmeter reading is



Ⓐ 0.1

Ⓑ 0.15

Ⓒ 0.2

Ⓓ 0.01

53. A 20MVA, 6.6 KV, 3-phase alternator is connected to a 3-phase transmission line. The per unit positive-sequence, negative-sequence and zero-sequence impedances of the alternator are $j0.1, j0.1$ and $j0.04$ respectively. The neutral of the alternator is connected to ground through an inductive reactor of $j0.05$ p.u. The per unit positive ,negative and zero-sequence impedances of transmission line are $j0.1, j0.1$ and $j0.3$ respectively. All per unit values are based on the machine ratings. A solid ground fault occurs at one phase of the far end of the transmission line. The voltage of the alternator neutral with respect to ground during the fault is

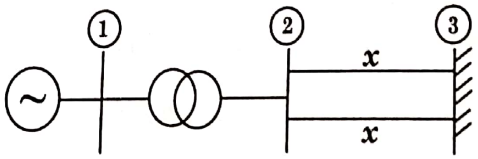
Ⓐ 513.8 V

Ⓑ 889.9 V

Ⓒ 1112.0 V

Ⓓ 642.2 V

54. A generator with constant 1.0 p.u. terminal voltage supplies power through a step-up transformer of 0.12 p.u. Reactance and a double-circuit line to an infinite bus bar as shown in the figure. The infinite bus voltage is maintained at 1.0 p.u. Neglecting the resistances and suspectances of the system, the steady state stability power limit of the system is 6.25 p.u. If one of the double-circuit is tripped, then resulting steady state stability power limit



Ⓐ 12.5 p.u.

Ⓑ 3.125 p.u.

Ⓒ 10.0 p.u.

Ⓓ 5.0 p.u.

55. What values of A, B, C and D satisfy the following simultaneous Boolean equations?

$\overline{A} + AB = 0, AB = AC, A\overline{C} + CD = \overline{C}D$

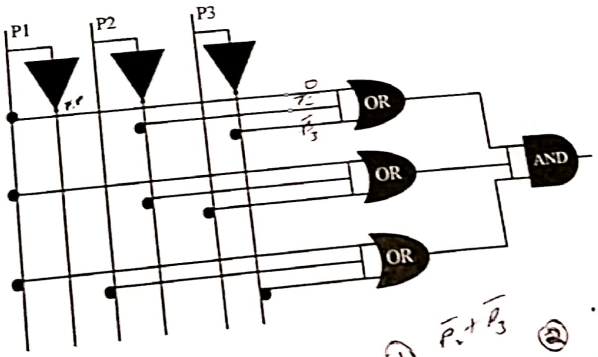
Ⓐ $A = 1, B = 0, C = 0, D = 1$

Ⓑ $A = 1, B = 1, C = 0, D = 0$

Ⓒ $A = 1, B = 0, C = 1, D = 1$

Ⓓ $A = 1, B = 0, C = 0, D = 0$

56. The output of the following combinational circuit is



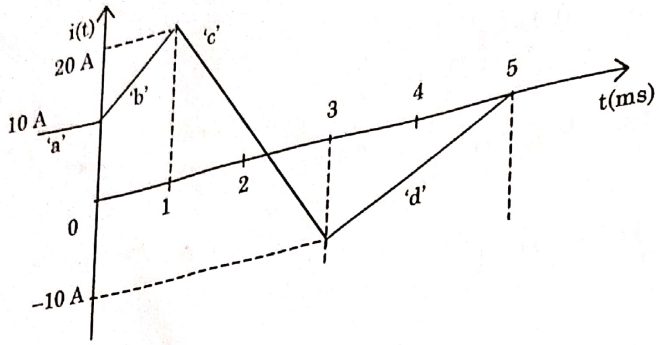
Ⓐ $P_1 + P'_2 P_3$

Ⓑ $P_1 + P'_2 P'_3$

Ⓒ $P_1 + P_2 P'_3$

Ⓓ $P'_1 + P_2 P_3$

57. A current waveform $i(t)$ as shown in figure below is applied to a pure inductor of 20 mH. The value of voltage at 2 ms is



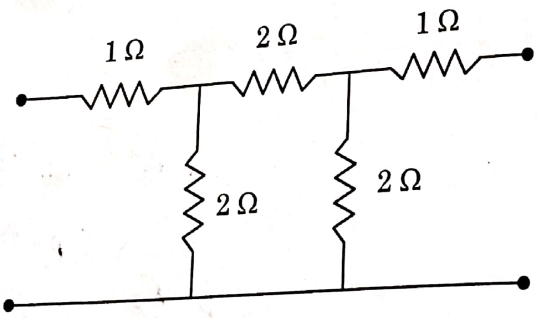
Ⓐ –300 V

Ⓑ 300 V

Ⓒ 200 V

Ⓓ –200 V

58. The Z_{11} and Z_{22} parameters of the given network in ohms are



Ⓐ $\frac{7}{3}$ and $\frac{2}{3}$

Ⓑ $\frac{2}{3}$ and $\frac{7}{3}$

Ⓒ $\frac{7}{3}$ and $\frac{7}{3}$

Ⓓ $\frac{2}{3}$ and $\frac{2}{3}$

59. The transfer functions of two compensators are given below:

$$C_1 = \frac{10(s+1)}{(s+10)}, C_2 = \frac{(s+10)}{10(s+1)}$$

Which one of the following statements is correct?

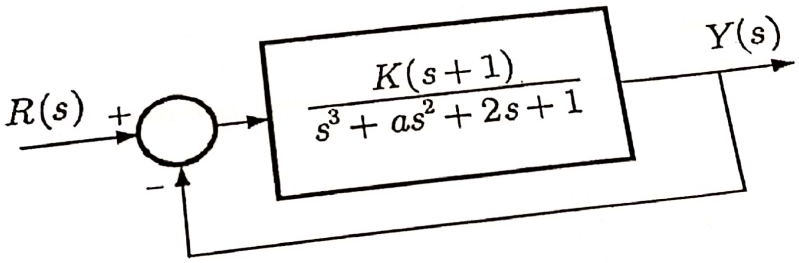
(A) C_1 is lead compensator and C_2 is a lag compensator

(B) C_1 is a lag compensator and C_2 is a lead compensator

(C) Both C_1 and C_2 are lead compensator

(D) Both C_1 and C_2 are lag compensator

60. The feedback system shown below oscillates at 2 rad / s when



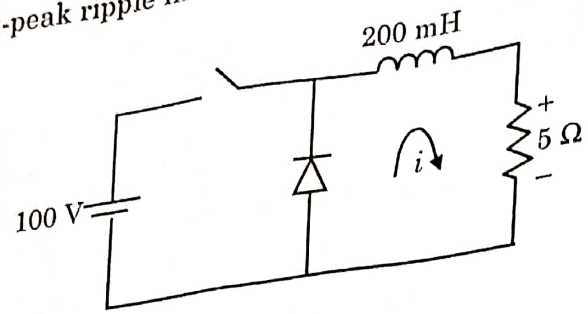
(A) $K = 2$ and $a = 0.75$

(B) $K = 3$ and $a = 0.75$

(C) $K = 4$ and $a = 0.5$

(D) $K = 2$ and $a = 0.5$

61. The figure below shows a step-down chopper switched at 1 kHz with a duty ratio D =0.5 . The peak-peak ripple in the load current is close to



Ⓐ 10 A

Ⓑ 0.5 A

Ⓒ 0.125 A

Ⓓ 0.25 A

62. A half-controlled single-phase bridge rectifier is supplying an R-L load. It is operated at a firing angle α and the load current is continuous. The fraction of cycle that the freewheeling diode conducts is

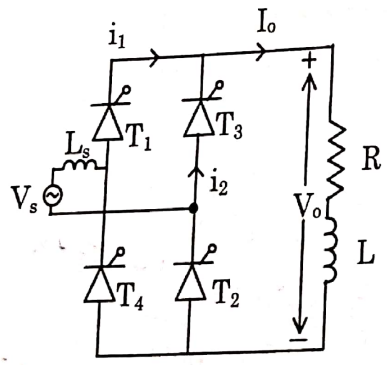
Ⓐ $\frac{1}{2}$

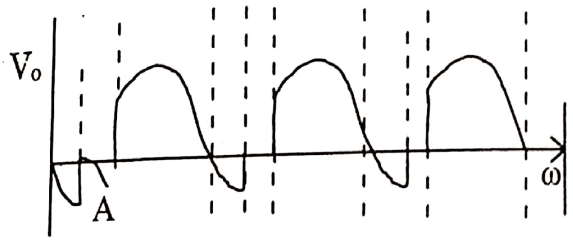
Ⓑ $1-\frac{\alpha}{\pi}$

Ⓒ $\frac{\alpha}{2\pi}$

Ⓓ $\frac{\alpha}{\pi}$

63. The figure below shows a $1-\Phi$ full bridge converter and its output voltage V_o, during the part "A" marked in output voltage waveform, the devices that are conducting are





Ⓐ T_1, T_2

Ⓑ T_3, T_4

Ⓒ T_1, T_2, T_3, T_4

Ⓓ no device is conducting

64. A 3 phase squirrel cage induction motor has maximum torque equal to twice the full load torque. The per phase rotor resistance and per phase stand still reactance referred to stator are 0.2 ohm and 2 ohm respectively. Neglect stator impedance. The ratio of starting torque to full load torque with star delta starter is

Ⓐ 0.313 Ⓑ 0.25

Ⓒ 0.496 Ⓓ 0.132

65. A DC series motor draws a line current of 100 A from the mains of 230V, while running at 1000 rpm. Its armature resistance is 0.15 ohm and the field resistance is 0.1 ohm. The speed of the motor when drawing 25 A, with flux is 40 % of that of 100A line current.

Ⓐ 1000 rpm Ⓑ 2728 rpm

Ⓒ 994 rpm Ⓓ 1396 rpm

66. A 3 - phase, star connected, 415 V, 6 pole, 50 Hz synchronous motor with negligible armature resistance has per phase synchronous reactance of 2 Ω, has an emf of 520 V. The motor develops a torque of 220 Nm. The power factor is

Ⓐ 0.76 lead Ⓑ 0.88 lag

Ⓒ 0.95 lag Ⓓ 0.5 lag

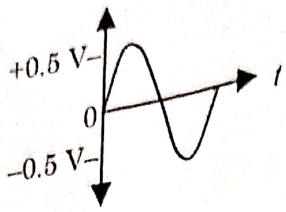
415 V

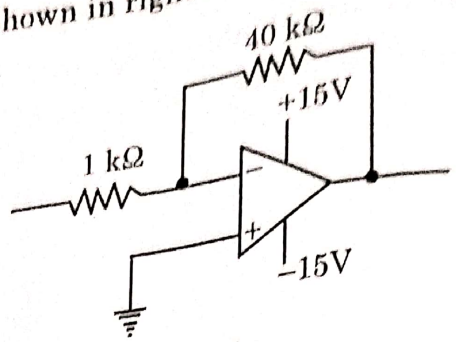
67. In a DC shunt machine running at 500 rpm, the hysteresis and eddy current losses are 250 W and 150 W respectively. Assume flux is constant. The speed at which the total core losses are reduced by 30 % is

Ⓐ 400 rpm Ⓑ 450.6 rpm

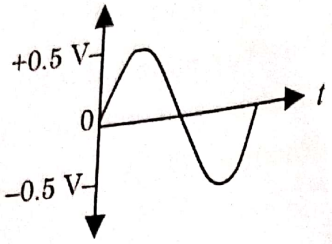
Ⓒ 472.8 rpm Ⓓ 383.5 rpm

68. The output voltage for the circuit shown in figure
in the figure as input to the circuit shown in right half of figure

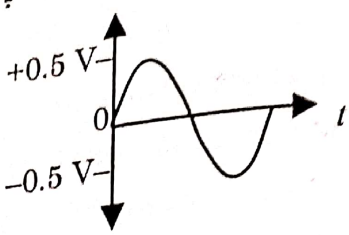




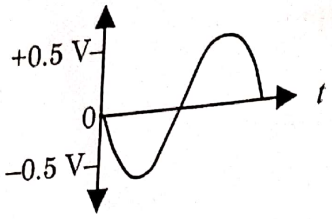
Ⓐ



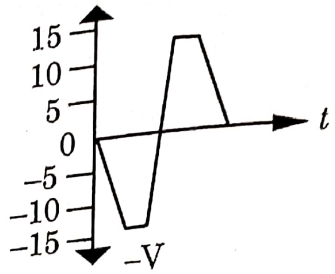
Ⓑ



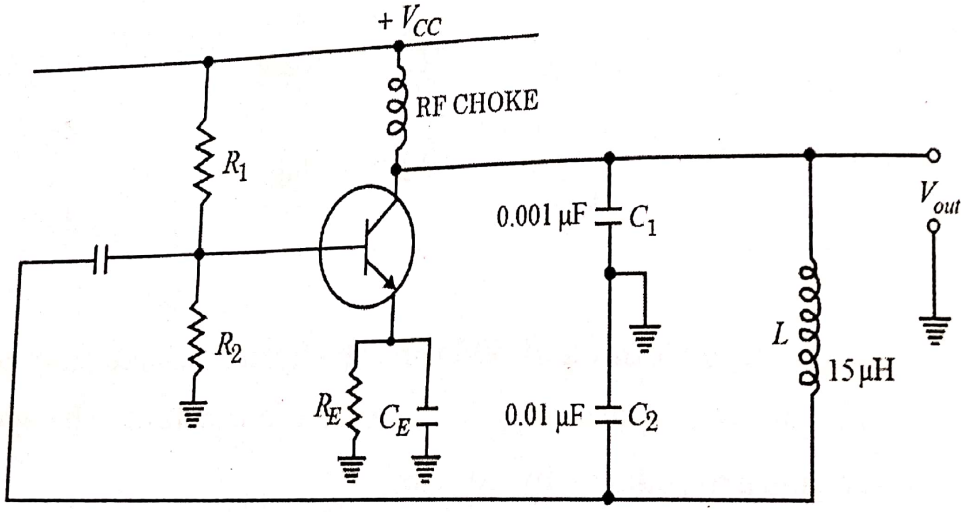
Ⓒ



Ⓓ



69. The operating frequency of the oscillator shown in figure below is



Ⓐ 553 kHz

Ⓑ 151 kHz

Ⓒ 1361 kHz

Ⓓ 1092 kHz

70. A 50Hz, bar primary CT has a secondary with 500 turns. The secondary supplies 5A current into a purely resistive burden of 1Ω. The magnetizing amphere-turns is 200. The phase angle between the primary and secondary current is

Ⓐ 4.58°

Ⓑ 85.4°

Ⓒ 94.6°

Ⓓ 175.4°

71. An analog voltmeter uses external multiplier settings. With a multiplier setting of $20k\Omega$, it reads 440V and with a multiplier setting of $80k\Omega$, it reads 352V. For a multiplier setting of $40k\Omega$, the voltmeter reads

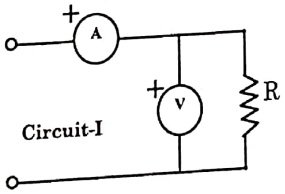
Ⓐ 371 V

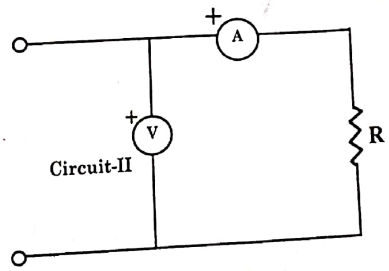
Ⓑ 383 V

Ⓒ 394 V

Ⓓ 406 V

72. The power in a resistor R is estimated by measuring the voltage and current using the voltmeter-ammeter method. Two different arrangements can be used as shown in circuits I and II. Less erroneous results are obtained by adapting





Ⓐ circuit I for low values of R

Ⓑ circuit II for low values of R

Ⓒ circuit I for high values of R

Ⓓ circuit II for low and high values of R

73. Incremental fuel costs (insome appropriate unit) for a power plant consisting of three generating units are :

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

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

(A) $P_1 = 242.856$ MW; $P_2 = 157.14$ MW and $P_3 = 300$ MW

(B) $P_1 = 157.14$ MW; $P_2 = 242.856$ MW and $P_3 = 300$ MW

(C) $P_1 = 300$ MW; $P_2 = 300$ MW and $P_3 = 100$ MW

(D) $P_1 = 233.3$ MW; $P_2 = 233.3$ MW and $P_3 = 233.4$ MW

74. The following data refers to a 50 Hz, 3 phase transmission line:

Length : 10 km, Sending end voltage: 11 kV, Load delivered at receiving end: 1,000 kW at 0.8 p.f. lag, Resistance of each conductor: 0.500 ohm/km, Reactance of conductor: 0.560 ohm/km. Calculate the Receiving end voltage.

(A) 10.5 kV

(B) 10.65 kV

(C) 10.1 kV

(D) 9.81 kV

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

(A) nominal voltage of the line

(B) physical length of the line

(C) wavelength of the line

(D) power transmitted over the line