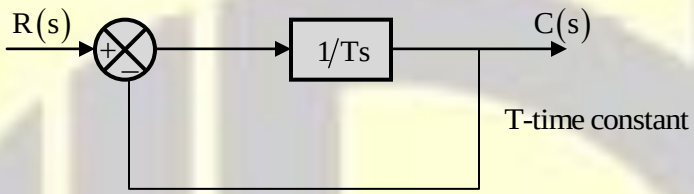
1. For the system to be stable, in a negative feedback systems, with increase of feedback loops the range of gain (K)

(A) Reduces (B) Increases

(C) Does not change (D) Exponentially increases

---

2. What is the impulse response for the system indicated below?



(A) $\frac{1}{T}e^{-\frac{t}{T}u(t)}$ (B) $Te^{-Tt}u(t)$ (C) $\frac{1}{T}e^{-\frac{t}{T}}$ (D) Te^{-Tt}

---

3. The open loop transfer function of a unity feedback control system is $G(s)=\frac{K}{(s+2)(s+1)(s^3+6s+25)}$. Determine the range of gain 'K' for the unity feedback control system to be stable.

(A) $+200 < K < 666.25$ (B) $-200 < K < 112.17$

(C) $-200 < K < 666.25$ (D) $0 < K < 200$

---

4. For the step response $C(s)=\frac{10(s-2)}{s(s^2+4s+5)}$ find initial and final value of C(s).

(A) Initial value = 0, Final value = 0

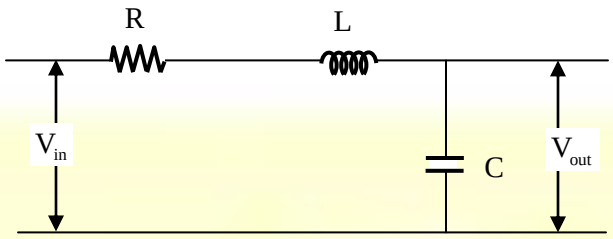
(B) Initial value = 0, Final value = –4

(C) Initial value = 0, Final value = cannot determine

(D) Initial value = cannot determine, Final value = 0

---

5. What is the condition for the below system to be critically damped?



(A) $R\sqrt{\frac{L}{C}}=1$ (B) $\frac{R}{2}\sqrt{\frac{L}{C}}=1$ (C) $\frac{1}{\sqrt{LC}}=1$ (D) $\frac{R}{2}\sqrt{\frac{C}{L}}=1$

---

6. Transfer function of two compensators are:

$$C_1=\frac{100(S+3)}{(S+200)} \qquad C_2=\frac{S+200}{100(S+3)}$$

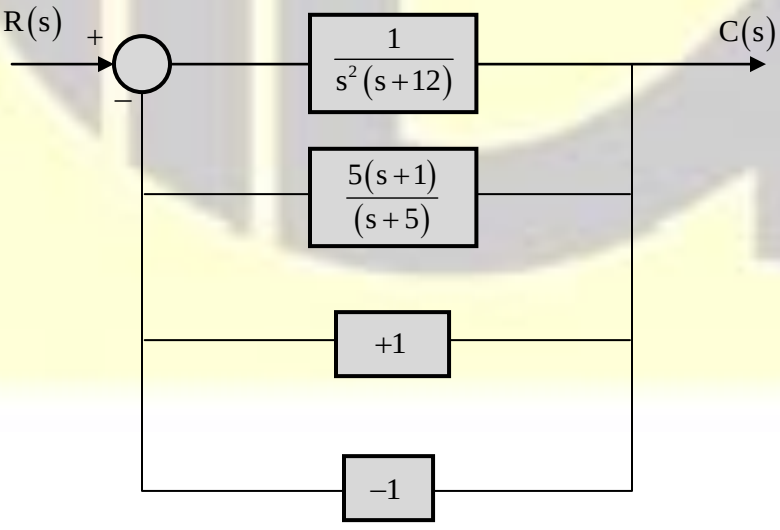
Which of the following statement is correct?

(A) C_1 – lead and C_2 – lag (B) C_1 – lag and C_2 – lead

(C) Both C_1 and C_2 are lag (D) Both C_1 and C_2 are lead

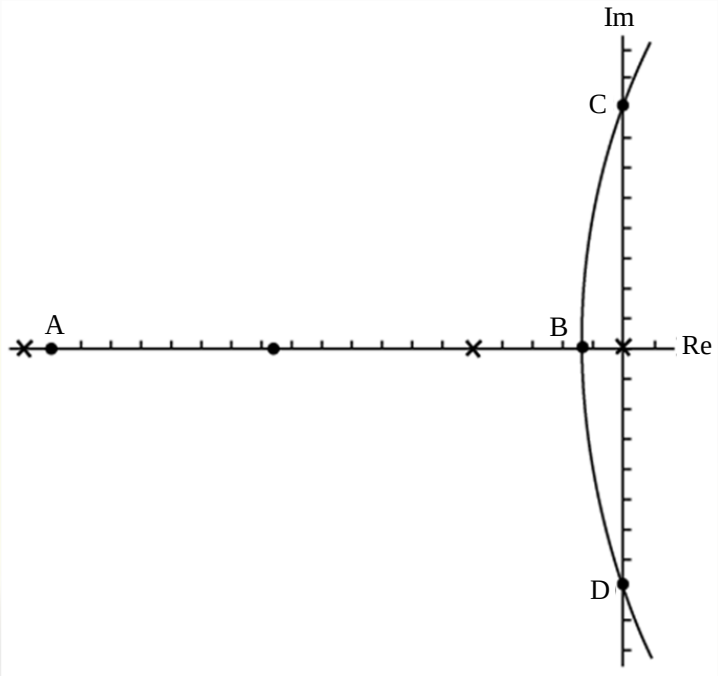
---

7. In the system shown below, what is steady state error in unit ramp response?



(A) 5/4 (B) 4/5 (C) 3/5 (D) 5/5

8. Typical root locus diagram of a system is shown below. Find the point where the system is critically damped.



(A) At point 'A'
(B) At Point 'B'
(C) At Points 'C' and 'D'
(D) None of the above

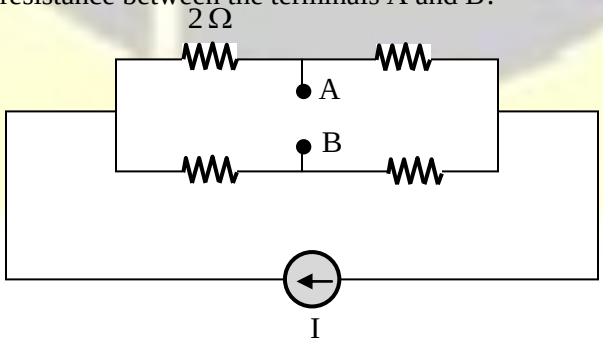
---

9. If a network consists of 'n' number of principle nodes and 'b' numbers of branches. Then, mesh analysis becomes simpler than nodal analysis if 'n' is greater than

(A) b –1 (B) b + 1 (C) b/2 – 1 (D) b/2 + 1

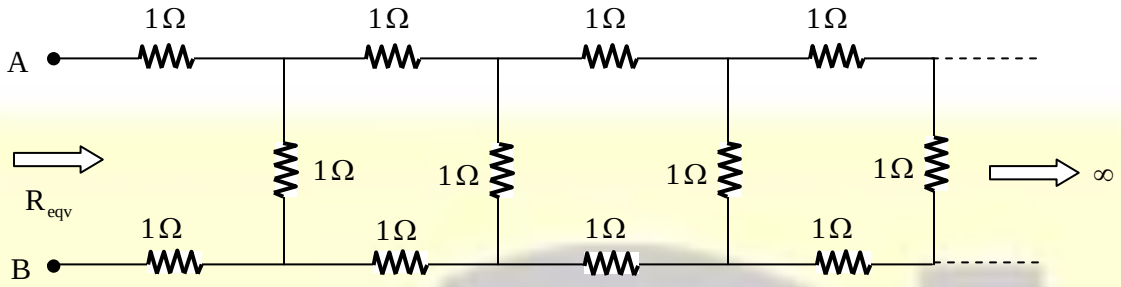
---

10. What is the equivalent resistance between the terminals A and B?



(A) 2.5 Ω (B) 2.83 Ω (C) 3.33 Ω (D) 2.86 Ω

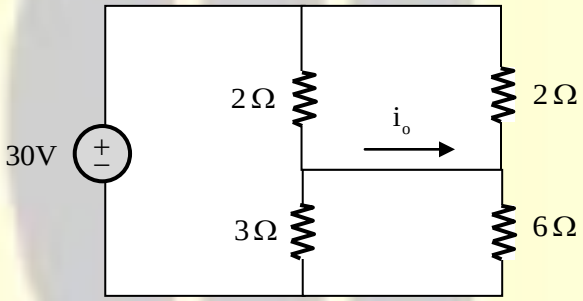
11. Find R_{eqv} across the terminals A and B.



(A) $\left(1+\sqrt{2}\right)\Omega$ (B) $\left(1+2\sqrt{2}\right)\Omega$ (C) $\left(1+\sqrt{3}\right)\Omega$ (D) $\left(1+2\sqrt{3}\right)\Omega$

---

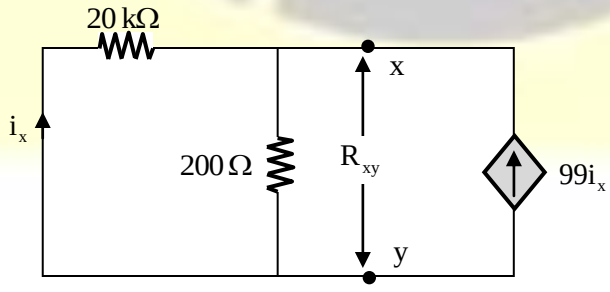
12. Calculate i_0 for the circuit diagram given below:



(A) 5/3 A (B) –5/3 A (C) 10/3 A (D) –10/3 A

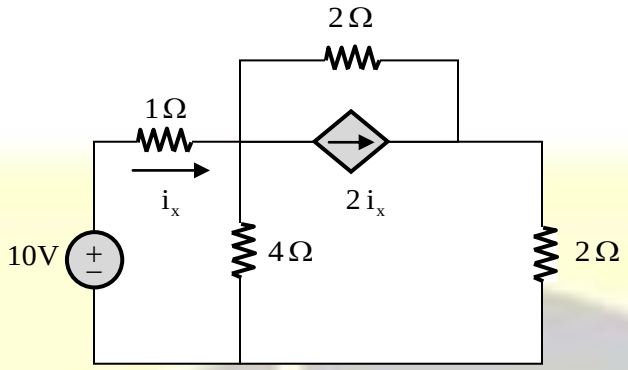
---

13. In the circuit given below, calculate the value of R_{xy}.



(A) 100Ω (B) 200Ω (C) 198.01Ω (D) 20 kΩ

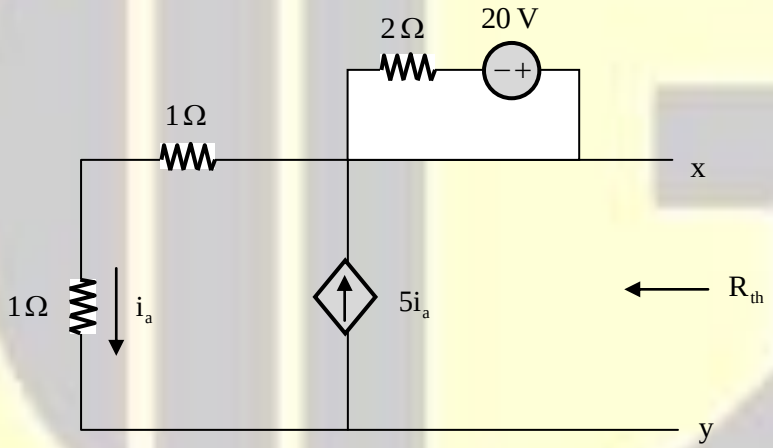
14. Calculate i_x in the circuit diagram given below:



(A) 2A (B) 10A (C) 5 A (D) None of the above

---

15. For the circuit given below. What is the value of Thevenin equivalent resistance (R_{th}) across the terminals x and y.

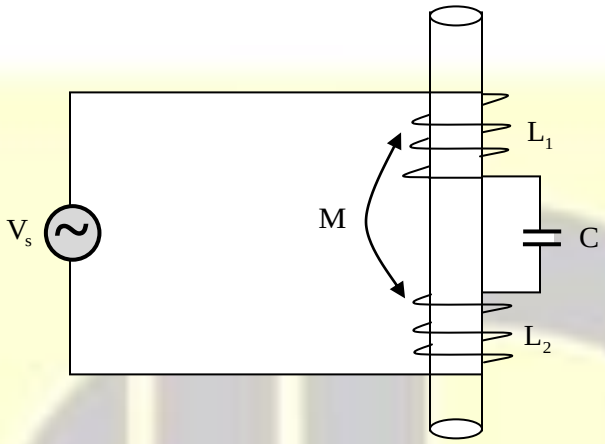


(A) $+1/2\Omega$ (B) $-1/2\,\Omega$ (C) $1\,\Omega$ (D) $2\,\Omega$

---

16. What is the resonant frequency of circuit shown below?

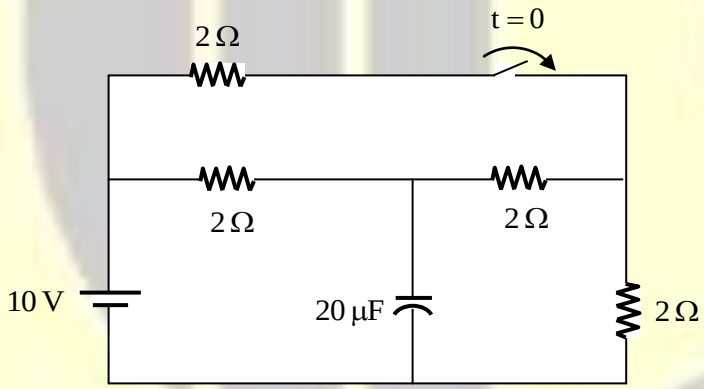
Where $R = 10\,\Omega$, $L_1 = L_2 = 20$ mH, Mutual Inductance M = 5 mH, C = 0.05 µH



(A) 4.18 kHz (B) 2.88 kHz (C) 5.18 kHz (D) 3.18 kHz

---

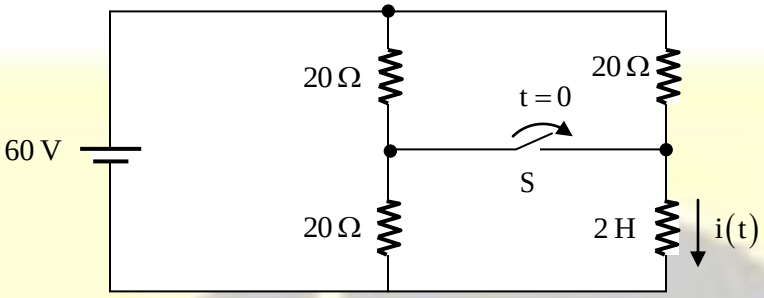
17. What is the time constant of the circuit shown below, when t = 0 the Switch S is closed?



(A) 26.67 µsec (B) 80 µsec (C) 16 µsec (D) 24 µsec

---

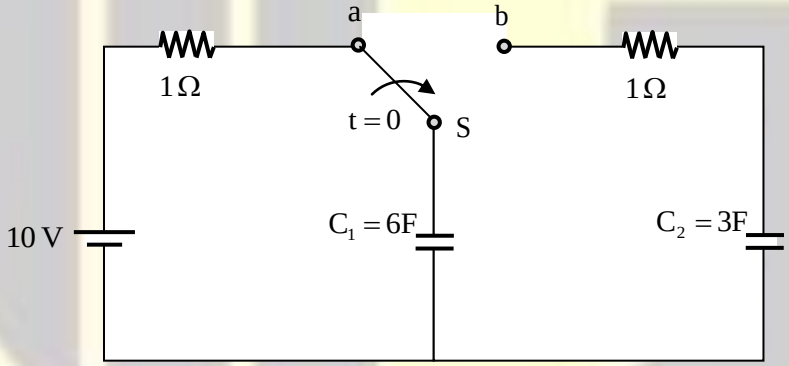
18. At time t = 0 Switch S is closed in the circuit shown. What is the expression for the current i(t) through the inductor?



(A) $6-\left(3\times e^{-10t}\right)$ (B) $6-\left(3\times e^{-10t/3}\right)$ (C) $6-\left(3\times e^{-5t}\right)$ (D) $6-\left(3\times e^{-5t/3}\right)$

---

19. Determine the steady state voltage across the capacitor C_1 and C_2 shown in the circuit below. Initial voltage $V_{C_2}=0V$



(A) $V_{C_1}=V_{C_2}=20/3V$ (B) $V_{C_1}=V_{C_2}=10/3V$

(C) $V_{C_1}=20/3$ V and $V_{C_1}=10/3$ V (D) $V_{C_1}=10/3$ and $V_{C_2}=20/3$ V

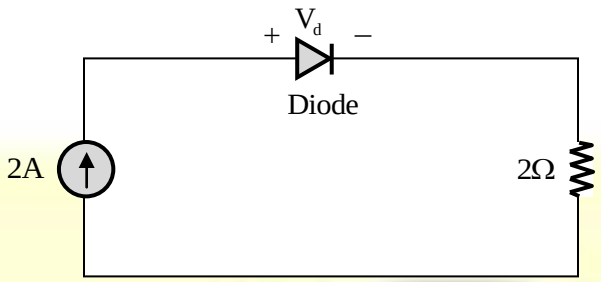
---

20. What is the dynamic Impedance offered by Ideal tank circuit in a network?

(A) Zero (B) Resistive (C) Infinity (D) None of the above

---

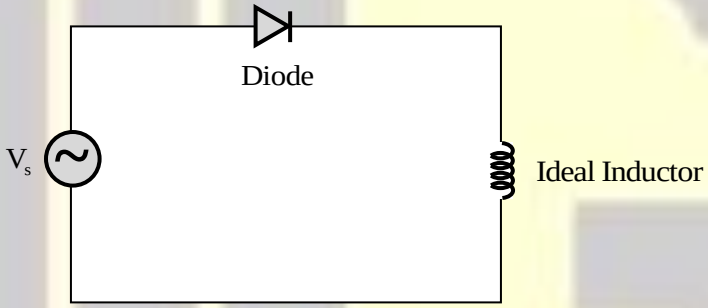
21. Find the voltage drop (V_d) across Silicon diode in the circuit below



(A) 0.7V (B) 0.3V (C) 0.42V (D) 0.052V

---

22. In the circuit given below Inductor used is ideal inductor, What is the conduction angle of diode?



(A) 90° (B) 180° (C) 270° (D) 360°

---

23. A single phase full bridge converter supplies power to constant current load. If the triggering angle is 45°, what is the input power factor of the converter?

(A) 0.637 (B) 0.837 (C) 0.937 (D) None of the above

---

24. Input voltage $v = 230\sin(100\pi t)$ Volts is given a converter and the current drawn by the converter is $i = 20\sin\left(100\pi t - \frac{\pi}{3}\right) + 10\sin(300\pi t + 45°) + 2\sin\left(700\pi t - \frac{\pi}{6}\right)$ Amps. What is the active power drawn by the converter?

(A) 2300 W (B) 1150 W (C) 4324 W (D) 2162 W

---

25. If a boost converter operates with a duty ratio D = 1 then output voltage is

(A) Infinity (B) Input voltage

(C) Zero (D) Two times the input voltage

---

26. In a single phase asymmetrical half controlled rectifier with firing angle 'α ' feeds a constant current load. What will be conduction angle of diodes?

(A) $\pi + \alpha$ (B) $\pi - \alpha$ (C) 2α (D) 2π

---

27. In a three phase half controlled rectifier with constant current load and freewheeling diode, what is the fraction of cycle the diode conducts? Consider firing angle (α) of thyristors greater than 60°.

(A) $(\alpha - \pi\ 2/)3/\ \pi$ (B) $(\alpha + \pi\ 2/)3/\ \pi$

(C) $(\alpha - \pi\ )3/ \times 2/3\ \pi$ (D) $(\alpha + \pi\ )3/ \times 2/3\ \pi$

---

28. A step down chopper operates from a D.C. voltage source Vs = 400 V and feeds a DC motor armature with a back emf E_b = 300 V. From the oscilloscope traces it is found that the current rises for a time t_r = 10 m sec and falls to zero over time t_f = 5 m sec and remains zero for a time of to = 6 m sec in every chopping cycle. Then, average DC voltage across the freewheeling diode will be

(A) 276 V (B) 257 V (C) 262 V (D) 300 V

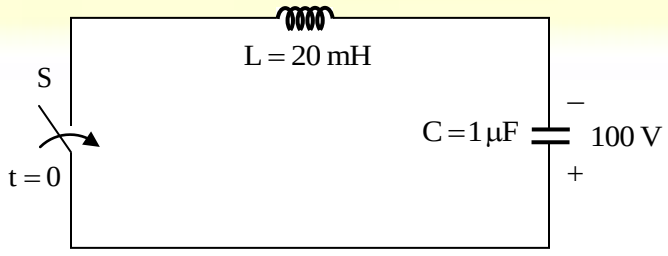
---

29. A single phase inverter has a square wave output voltage. What is the percentage of fifth harmonic component in relation to fundamental component present in the output voltage?

(A) 40% (B) 30% (C) 20% (D) 10%

---

30. In the LC circuit shown in the figure initial current through the inductor is zero, initial voltage across the capacitor is 100 V. Switch S is closed at t = 0 sec. The current through the circuit is



(A) $7.07\sin\left(7.07\times10^{3}t\right)$ (B) $0.707\cos\left(7.07\times10^{3}t\right)$

(C) $0.707\sin\left(7.07\times10^{3}t\right)$ (D) $7.07\cos\left(7.07\times10^{3}t\right)$

---

31. Two DC machines are mechanically coupled. One is operating as a motor and the other as generator. The iron and frictional losses of the machines will be identical when:

(A) Their speeds are identical

(B) Their speeds and excitation are identical

(C) Their speeds are equal and back emfs are half the supply voltage

(D) Their armature sizes are identical

---

32. If the terminal voltage of a DC shunt motor is halved, keeping load torque varying as square of speed. Then, which of the following statements are correct?

i. Speed is halved

ii. Speed remains unaltered

iii. Armature current is doubled

iv. Armature current is unaltered

(A) i and iii (B) i and iv (C) ii and iii (D) ii and iv

---

33. A DC shunt motor is excited from voltage source and its brush axis rotated by an angle ‘α ’ from the geometrical neutral axis. The torque developed will be proportional to:

(A) sinα (B) cosα (C) tanα (D) cos2α

---

34. If the current drawn by a DC series motor is increased from 10 A to 12 A (neglect saturation), what is the increase in torque expressed as percentage of initial torque?

(A) 21% (B) 25% (C) 41% (D) 44%

---

35. Following data are obtained by slip test on a salient pole machine:

$I_{dmax} = 10\ A \quad I_{dmin} = 6.5\ A$

$V_{dmax} = 30\ V \quad V_{dmin} = 25\ V$

What is the direct axis reactance 'X_d' and quadrature axis reactance 'X_q'?

(A) $X_d = 3\Omega, X_q = 3.86\Omega$ (B) $X_d = 4.61\Omega, X_q = 2.5\Omega$

(C) $X_d = 3\Omega, X_q = 2.5\Omega$ (D) $X_d = 4.61\Omega, X_q = 3.86\Omega$

---

36. Two mechanically coupled alternators deliver power at 50 Hz and 60 Hz respectively. What is the highest speed of the alternators?

(A) 3600 rpm (B) 3000 rpm (C) 600 rpm (D) 500 rpm

---

37. A 3 Phase, 11 kV, 5 MVA alternator has synchronous reactance of 10 Ω per phase. Its excitation is such that the generated emf is 14 kV. If the alternator is connected to infinite bus the maximum output of the alternator at a given excitation is

(A) 15400 kW (B) 8000 kW (C) 6200 kW (D) 5135 kW

---

38. The resultant flux density in the air gap of synchronous generator is lowest during:

(A) Open Circuit (B) Solid Short Circuit

(C) Full Load (D) Half Load

---

39. A voltmeter gives 120 oscillations per minute when connected to the rotor of an induction motor. When the stator frequency is 50 Hz, what is the slip of the motor?

(A) 2% (B) 2.5% (C) 4% (D) 5%

---

40. A 6 pole, 3 phase alternator running at 1000 rpm supplies power to an 8 pole, 3 phase, induction motor which has a rotor current of frequency 2 Hz. What is the speed at which the motor operates?

(A) 1000 rpm (B) 960 rpm (C) 750 rpm (D) 720 rpm

---

41. A 4 kVA, 400 V/200 V single phase transformer has resistance of 0.02 p.u and reactance of 0.06 p.u. The resistance and reactance referred to HV side are

(A) 0.2 Ω and 0.6 Ω (B) 0.8 Ω and 2.4 Ω

(C) 0.08 Ω and 0.24 Ω (D) 2 Ω and 6 Ω

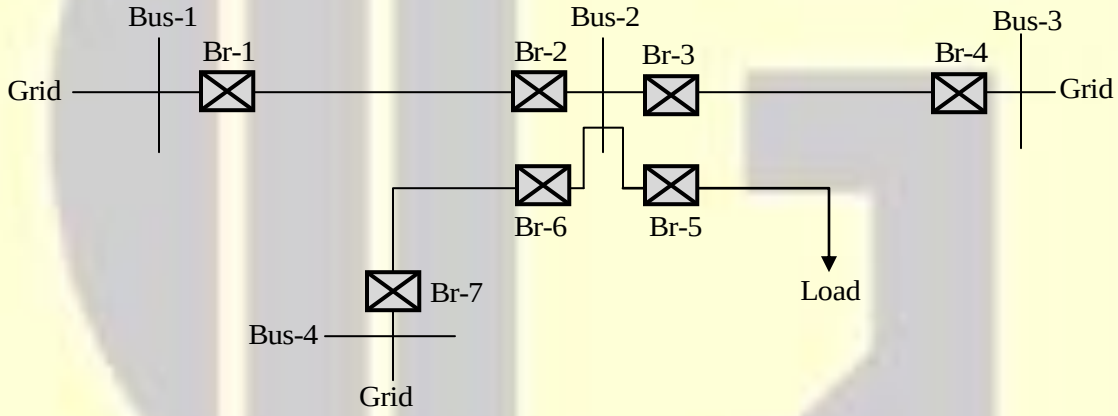
---

42. A 100/5 A bar primary current transformer supplies an overcurrent relay set at 25% pick up and it has a burden of 5 VA. The secondary voltage is

(A) 1 V (B) 1.25 V (C) 2.5 V (D) 4 V

---

43. The distribution system indicated below is to be protected with overcurrent protection. Identify the locations where essentially directional overcurrent relays will be required considering proper fault discrimination.



(A) Br-1, Br-4, Br-8 and Br-7 (B) Br-2, Br-3, Br-5 and Br-6

(C) Br-2, Br-3 and Br-6 (D) Br-1, Br-4, Br-7, Br-5

---

44. Impedance of single phase, two winding transformer referred to primary side is 0.1 + j 0.6 p.u. The rating of the transformer is 200 V/400 V, 1 kVA. The per unit impedance is calculated on transformer base, then what is the equivalent impedance of transformer referred to secondary in ohms?

(A) 80+ j 400 Ω (B) 5 + j 25 Ω

(C) 16 + j 80 Ω (D) None of the above

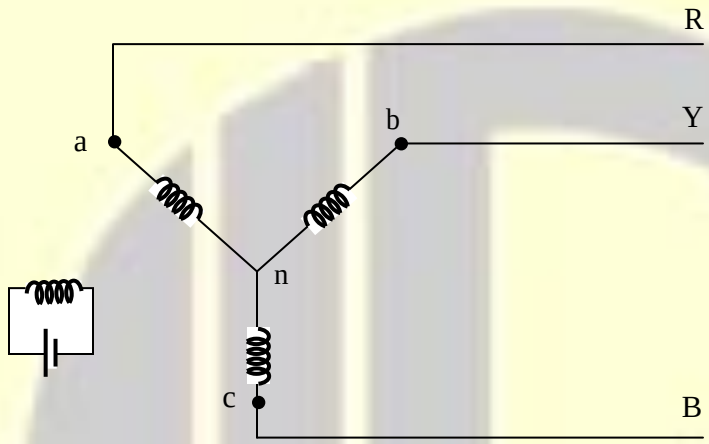
45. What is the order of sequence of impedance in salient pole alternator?

(A) $Z_1 > Z_2 > Z_0$ (B) $Z_1 < Z_2 < Z_0$

(C) $Z_0 > Z_1 > Z_2$ (D) None of the above

---

46. A schematic diagram of an alternator is shown below where $V_{an} = V_{bn} = V_{cn} = V_1$.



If a single phase to ground fault occurs at location 'a', what will be the voltage at 'b' and 'c'?

(A) $V_{bn} = V_{cn} = \sqrt{3}\, V_1$ (B) $V_{bn} = V_{cn} = V_1$

(C) $V_{bn} = V_{cn} = 0$ (D) None of above

---

47. Which among the following are suitable for improving the transient stability limits of a power system?

i. Increase system voltage by AVR

ii. Use high speed excitation systems

iii. Use high speed reclosing breakers

iv. Increase system frequency

(A) i, ii and iv (B) i, iii and iv

(C) i, ii, iii and iv (D) i, ii and iii

---

48. The Y_{bus} matrix of a 100 bus interconnected system is 80% sparse. Then, the number of transmission lines in the system must be

(A) 950 (B) 3000 (C) 1900 (D) 1500

49. What is the size of a Jacobian matrix for a 100 bus power system with 29 nos. of voltage controlled buses?

(A) 29 × 29 (B) 170 × 170 (C) 169 × 169 (D) 30 × 30

---

50. The inductance of power transmission line increases with

(A) Decrease in line length

(B) Increase in diameter of conductor

(C) Increase in spacing between phase conductors

(D) Increase in load current carried by the conductor

---

51. Two buses in a system are maintained at the voltages $V_1 = 1.25 \angle 30°$ and $V_2 = 1.35 \angle 25°$. Bus 1 and Bus 2 are interconnected by a transmission line of impedance $(1.3 + j7)\Omega$. The power flow direction is

(A) Real power flows from Bus 1 to Bus 2

(B) Real power flows from Bus 2 to Bus 1

(C) No real power flows between the buses

(D) Reactive power flows from Bus 2 to Bus 1

---

52. Inductance of transmission line for a length of 400 kms in unsymmetrical configuration are:

$L_R = 30\,mH$ $L_Y = 20\,mH$ $L_B = 25\,mH$

What will be the inductance of each transmission line after transposing?

(A) $L_R = L_Y = L_B = 30\,mH$ (B) $L_R = L_Y = L_B = 20\,mH$

(C) $L_R = L_Y = L_B = 25\,mH$ (D) $L_R = L_Y = L_B = 75\,mH$

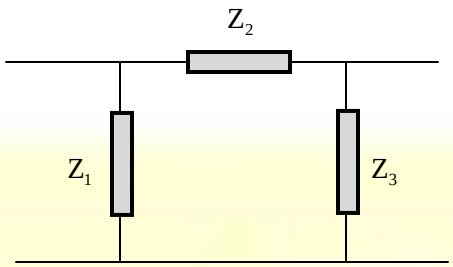
---

53. A short transmission line is having series impedance $Z = 0.07 + j0.12$ p.u. If the transmission line is operating under full load at leading p.f, what will be the possible voltage regulation of transmission line?

(A) 17% (B) 5% (C) 9% (D) 12%

---

54. Three networks are connected in cascade as shown below



ABCD parameters of the system is:

$$\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} 2.0\angle -10^\circ & 5\angle 30^\circ \\ 1.0\angle -20^\circ & 4.0\angle 10^\circ \end{bmatrix}$$

What is the value of Z_2 ?

(A) $5\angle 30^\circ$ (B) $2\angle 10^\circ$ (C) $0.2\angle 20^\circ$ (D) $1\angle 20^\circ$

---

55. The surge impedance of 400 km long overhead transmission line is $300\,\Omega$. For a 200 km length of the same transmission line surge impedance will be

(A) $150\,\Omega$ (B) $600\,\Omega$ (C) $300\,\Omega$ (D) $75\,\Omega$

---

56. In a power network, 380 kV is recorded at a 400 kV bus. A 60 MVAR, 400 kV shunt reactor is connected to the bus. What is the reactive power absorbed by the shunt reactor?

(A) 57 MVAR (B) 54.15 MVAR (C) 66.48 MVAR (D) 63.16 MVAR

---

57. Insulation resistance of a cable of length 20 km is 2 MΩ. What will be the insulation resistance of the same cable but for a length of 200 km?

(A) 2 MΩ (B) 20 MΩ (C) 0.2 MΩ (D) 200 MΩ

---

58. What is the 2's Complement of binary number 0010 0110 1001 1101?

(A) 0010 0110 1001 1110 (B) 1101 1001 0110 0010

(C) 1101 1001 0110 1101 (D) 1101 1001 0110 0011

59. Zero has two representations in

(A) Sign magnitude (B) 1's complement

(C) 2's complement (D) None of the above

---

60. What is the output of XOR gate with A and B as input?

(A) $\overline{AB}+AB$ (B) $\overline{(A+B)}(A+B)$ (C) $(A+B)\overline{AB}$ (D) $\overline{(A+B)}+AB$

---

61. How many numbers of half adders are required for m-bit numbers?

(A) $2\times m-1$ (B) 2^m-1 (C) $2\times m+1$ (D) $2\times m$

---

62. A Mod-6 counter is realized using 3 Nos. of flip-flops. The counter will skip

(A) 4 Counts (B) 3 Counts (C) 2 Counts (D) Zero Counts

---

63. An amplifier with negative feedback has overall gain of 100. The percentage change in gain with feedback and without feedback is 3% and 18% respectively. What is the feedback factor?

(A) 0.05 (B) 0.02 (C) 0.04 (D) 0.10

---

64. Two voltmeters with ranges of 0 to 100 V has sensitivities as 10 kΩ/V and 20 kΩ/V. What is the maximum voltage that can be measured when these voltmeters are connected in series?

(A) 200 V (B) 150 V (C) 100 V (D) None of the above

---

65. An ammeter with range 0 to 2 mA has internal resistance of 10 Ω. What is the value of shunt resistance in order to increase the range of ammeter to 100 A?

(A) 200 μΩ (B) 200 mΩ (C) 2 μΩ (D) 2000 mΩ

---

66. In a Dynamometer type wattmeter if current coil and voltage coil connections are interchanged then

(A) Current coil will damage (B) Voltage coil will damage

(C) No damage (D) None of the above

---

67. In a linear system, an input of $5\sin\omega t$ produces an output of $10\cos\omega t$. The output corresponding to input $10\cos\omega t$ will be equal to:

(A) $+5\sin\omega t$ (B) $-5\sin\omega t$ (C) $+20\sin\omega t$ (D) $-20\sin\omega t$

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68. In an induction motor r_2' is the rotor resistance. What is the resistance representing mechanical output in the equivalent circuit of an induction motor as referred to stator side?

(A) $r_2'\left(\frac{1}{s}-1\right)$ (B) r_2^2/s (C) $r_2^2\left(\frac{1}{s}-1\right)$ (D) r_2'/s

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69. The pressure coil of a dynamometer type wattmeter is

(A) Highly inductive (B) Highly resistive

(C) Purely resistive (D) Purely inductive

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70. What is the octal equivalent of Hexadecimal number CD.AB?

(A) 320.506 (B) 215.546 (C) 205.516 (D) 315.526

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71. The present age of father is twice that of the elder son. 10 years later the age of the father will be three times that of the younger son. If the difference of ages of the two sons is 15 years, the age of father is

(A) 50 years (B) 100 years (C) 70 years (D) 60 years

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72. The volume of a cone is equal to that of a cylinder whose height is 9 cm and diameter 60 cm. find the radius of the base of cone if its height is 108 cm.

(A) 12 cm (B) 18 cm (C) 10 cm (D) 15 cm

73. Traffic light at one particular crossing change after every 40 seconds. The traffic light at the next crossing changes after every 32 seconds. At a certain time they change together. After what time they will change together?

(A) 2 min. 40 sec (B) 1 min. 20 sec (C) 3 min. 20 s**ec.** (D) 2 min. 20 sec.

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74. A merchant has 120kg of rice. He sells a part of it at a profit of 10 % and the rest at a profit of 25%. He gains 15% on the whole. The quantity of rice sold at a profit of 25% is

(A) 50 kg (B) 55 kg (C) 40 kg (D) 30 kg

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75. A software engineer has a capability of thinking 100 lines of code in 5 minutes and can type 100 lines of code in 10 minutes. He takes a break of 5 minutes after every 10 minutes. How many lines of codes will he complete typing in 8 hours?

(A) 1600 lines (B) 2100 lines (C) 2133 lines (D) 2400 lines

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76. What is the value of $K = \int_0^{617\pi} |\sin x| dx$?

(A) 617 (B) 1234 (C) Zero (D) 617π

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77. Matrix A has following eigen values $\lambda_1 = +3j, \lambda_2 = +5j, \lambda_3 = +1j,$ then the matrix is

(A) Symmetric matrix (B) Skew Hermitian matrix

(C) Orthogonal matrix (D) None of the above

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78. In a school, 45% of the students play football, 30% of students play cricket and 15% of students play both. If a student is selected at random what is the probability that he plays football or cricket?

(A) 1/4 (B) 2/7 (C) 3/5 (D) 4/5

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79. The maximum value of function $(xy)^6$ on the ellipse $\frac{x^2}{4}+y^2=1$ occur at a point (x, y) for which y^2 is equal to

(A) $\sqrt{2}/3$ (B) 1/2 (C) 2/3 (D) 5/11

80. $y=\tan^{-1}(x^2/2)$ what is $\frac{dy}{dx}$?

(A) $\frac{4x}{(4+x)}$ (B) $\frac{4}{(4+x^2)}$ (C) $\frac{x}{(4+x^2)}$ (D) $\frac{4x}{(4+x^2)}$