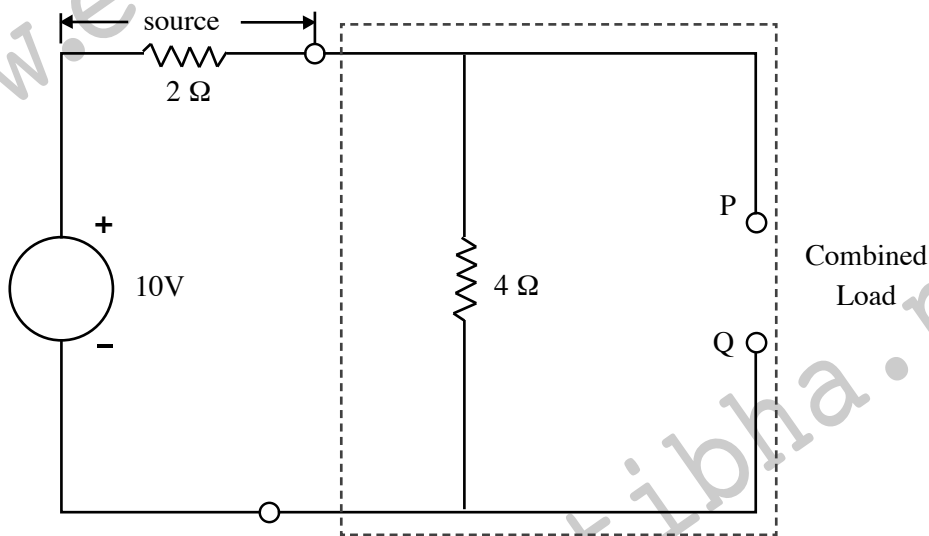


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ELECTRICAL ENGINEERING (Previous Paper 7)

AP TRANSCO - AP GENCO-AE QUESTION PAPER

- In two wattmeter method of 3-phase power measurements, when the power factor is 0.5
 - the readings of the two wattmeters are equal and positive
 - the readings of the two wattmeters are equal and positive
 - the total power is measured by only one wattmeter
 - the readings of the two wattmeters are not equal and positive.
- The reading of the wattmeter connected to measure the reactive power in a 3-phase circuit is given by zero when the line voltage is 400 volts and the line current is 15 amps. Then the power factor of the circuit is
 - zero
 - 0.6
 - 0.8
 - unity
- The resistance which should be connected between terminals P and Q for maximum transfer of power from source to the combined load is

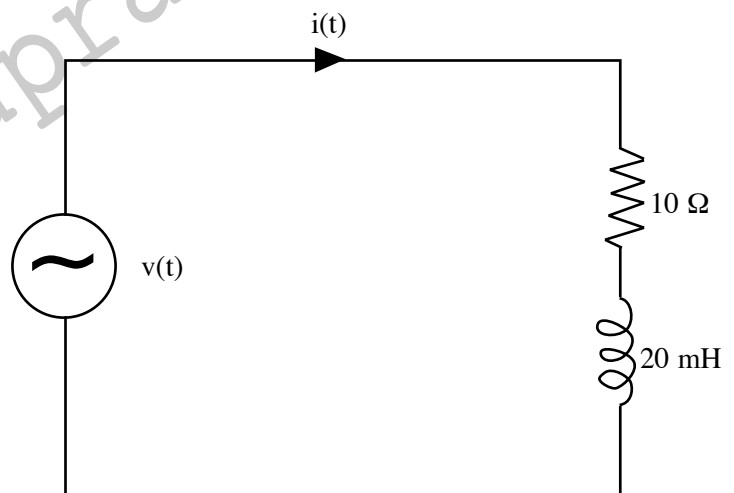


- zero Ω
- 2 Ω
- 4 Ω
- infinity ohms

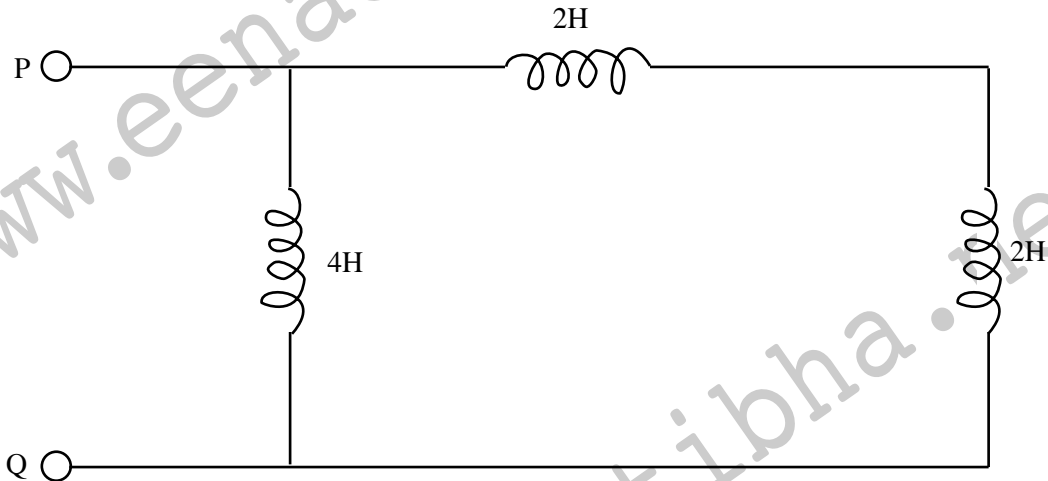
- In the given circuit below, the current is

$i(t) = 4 \sin (500 t)$ amps. The applied voltage $v(t)$ in volts is

- $40 \sin (500 t)$
- $56.56 \sin (500 t + 45^\circ)$
- $40 \cos (500 t)$
- $56.56 \cos (500 t + 45^\circ)$



5. In a two port network, open circuit impedance parameters express
- | | |
|--------------------------------------|--------------------------------------|
| a) V_1, V_2 in terms of I_1, I_2 | b) I_1, I_2 in terms of V_1, V_2 |
| c) V_1, I_1 in terms of V_2, I_2 | d) V_1, I_2 in terms of V_2, I_1 |
6. When two 2-port networks are connected in parallel, it is convenient to use
- | | |
|--------------------------------------|--|
| a) open circuit impedance parameters | b) short circuit admittance parameters |
| c) transmission parameters | d) inverse hybrid parameters |
7. On increasing the Q-factor of a coil
- its power factor increases
 - its power factor decreases
 - its power factor remains unaltered
 - its power may increase or decrease
8. The value of current at resonance in a series RLC circuit is affected by the value of
- | | | | |
|------|------|------|---------------|
| a) R | b) L | c) C | d) R, L and C |
|------|------|------|---------------|
9. The equivalent inductance of the below given circuit at the terminals P – Q is



- | | | | |
|-------|-------|-------|-------|
| a) 4H | b) 2H | c) 6H | d) 8H |
|-------|-------|-------|-------|
10. A capacitor C at time $t = 0$, with initial charge Q_0 acts as
- | | |
|-------------------|-------------------|
| a) short circuit | b) open circuit |
| c) current source | d) voltage source |
11. An electrical network with 8 independent nodes will have
- | | |
|----------------------|----------------------|
| a) 4 nodal equations | b) 8 nodal equations |
| c) 7 nodal equations | d) 9 nodal equations |
12. Impedance $Z_1 = 20 \angle 50^\circ \Omega$ and $Z_2 = 10 \angle 30^\circ \Omega$ Then $\frac{Z_1}{Z_2}$ is
- | | | | |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| a) $2 \angle 80^\circ \Omega$ | b) $2 \angle 50^\circ \Omega$ | c) $2 \angle 30^\circ \Omega$ | d) $2 \angle 20^\circ \Omega$ |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
13. Transformers used in conjunction with measuring instruments for measurement of high voltage and high currents are called
- | | |
|-----------------------|----------------------------|
| a) transformer meters | b) power transformers |
| c) pulse transformers | d) instrument transformers |

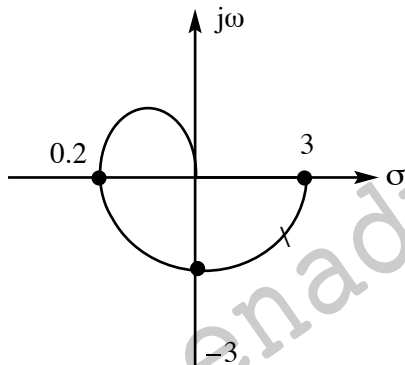
14. Swamping resistance is used in moving coil instruments to reduce error due to
 a) thermal emf
 b) temperature
 c) power taken by instrument
 d) galvanometer sensitivity
15. It is required to measure pf of an electrical load. No power factor meter is available. The following combination is used to determine pf
 a) a Wattmeter
 b) a voltmeter and ammeter
 c) a voltmeter, ammeter and wattmeter
 d) a kwh meter
16. The dielectric loss of a capacitor can be measured by
 a) Wein bridge
 b) Owen bridge
 c) Schering bridge
 d) Maxwell bridge
17. One of the following is an active transducer
 a) Strain gauge
 b) Selsyn
 c) Photo voltaic cell
 d) Photo emissive cell
18. The breakaway point of the root from the real axis for a closed loop system with loop gain

$$G(s) H(s) = \frac{K(s + 10)}{(s + 2)(s + 5)}$$

lies

- a) between - 10 and $-\infty$
 b) at $-\infty$
 c) between - 2 and origin
 d) between -2 and -5
19. A system has 12 poles and 2 zeros. Its high frequency asymptote in its magnitude plot will have a slope of
 a) -60db/dec
 b) -120 db/dec
 c) -200 db/dec
 d) -240 db/dec

20. The Nyquist plot of a transfer function is shown in the figure. The gain margin is



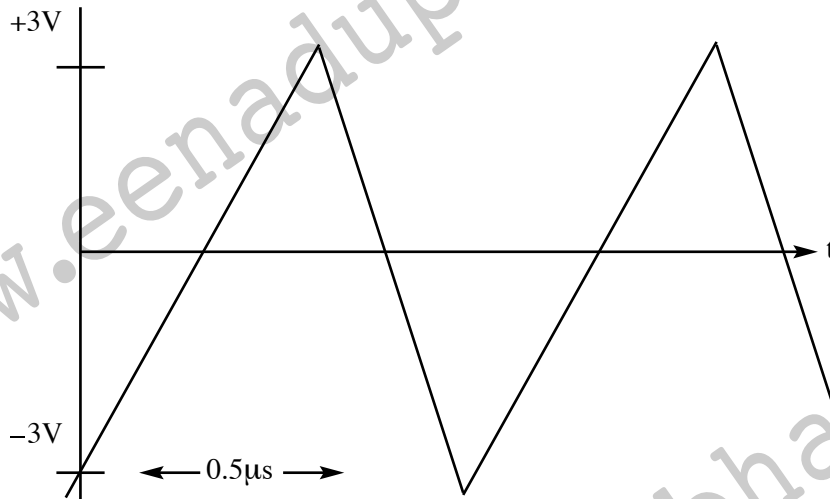
- a) 5
 b) 8
 c) 10
 d) 15
21. If the gain of the open loop system doubled, the gain margin
 a) gets one fourth
 b) gets halved
 c) gets doubled
 d) is not affected
22. The maximum phase shift that can be obtained by using a lead compensator with transfer function

$$G(s) = \frac{4(1 + 0.15s)}{(1 + 0.05s)}$$

is equal to

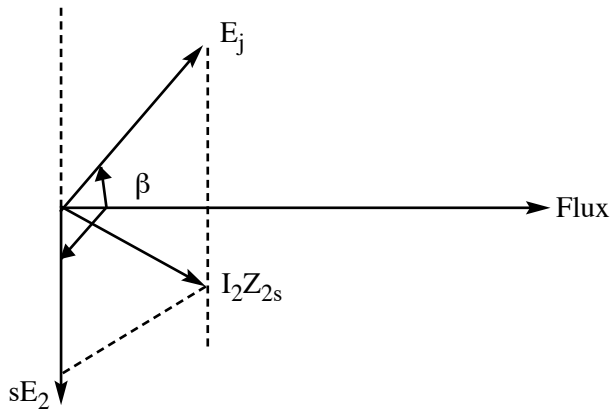
- a) 15°
 b) 30°
 c) 45°
 d) 60°

23. In a monostable multivibrator using 555 timer, the time delay is 100 m sec. timing resistor is 100 kW, the value of timing capacitor is
 a) 9 mF b) 0.9 μ F c) 9 F d) 1.8 μ F
24. The ideal operational amplifier has
 a) $R_i = \infty, R_o = \infty$ b) $R_i = 0, R_o = \infty$ c) $R_i = \infty, R_o = 0$ d) $R_i = 0, R_o = 0$
25. In the LM 741, LM stands for
 a) Motoral b) RCA
 c) Texas instruments d) National semiconductor
26. ADC preferred for digital panel meters and multimeters
 a) Flash ADC b) Servo ADC
 c) Successive approximation ADC d) Dual slope ADC
27. The output of an op-amp voltage follower is a triangular wave as shown in the figure for a square wave input of frequency 2 MHz and 8 V peak to peak amplitude. The slew rate of the op amp is



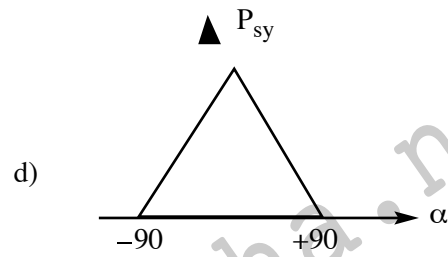
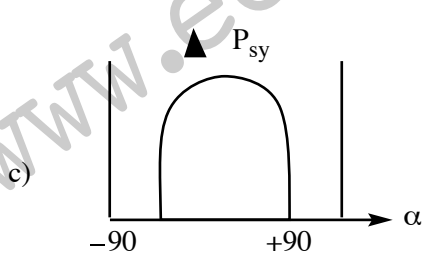
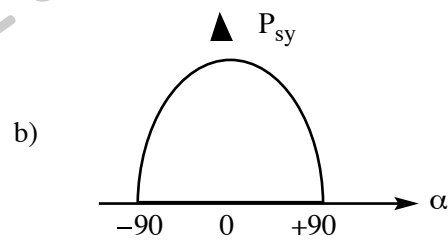
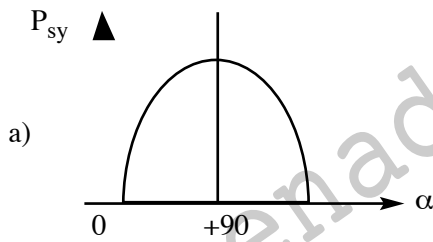
- a) 6 μ s b) 8 V/ μ s c) 14 V/ μ s d) 14 μ s
28. Match the following with parts in List - I with machines in List - II
- | List - I | List - II |
|----------------|------------------------|
| p. damper bars | 1. dc machine |
| q. rotor bars | 2. synchronous machine |
| r. commutator | 3. induction machine |
| a) p-1 q-2 r-3 | b) p-3 q-1 r-2 |
| | c) p-2 q-3 r-1 |
| | d) p-3 q-2 r-1 |
29. The following is the apparent disadvantage of auto transformer as compared to two winding transformer
 a) power rating is greater b) efficiency is low
 c) conductive isolation is not present d) voltage regulation is low
30. A 230/2300 V, Y/D 3-phase transformer is rated at 230 KVA. Its rated secondary current/phase is
 a) 33.33A b) 133.33A c) 66.66A d) 30.33A
31. A 3 phase induction motor is run in counter clockwise direction as motor with reverse phase sequence of supply. The range of slip variation for this mode is
 a) $0 < s < 1$ b) $2 < s < 1$ c) $0 < s < -1$ d) $3 < s < 2$

32. The following is phasor diagram or rotor variables of 3 phase induction motor with E_j as injected emf. This provides



- a) sub synchronous speed without pf improvement
- b) super synchronous speed without pf improvement
- c) sub synchronous speed with pf improvement
- d) super synchronous speed with pf improvement

33. The variation of synchronising power for variation of power angle for a salient pole machine will be



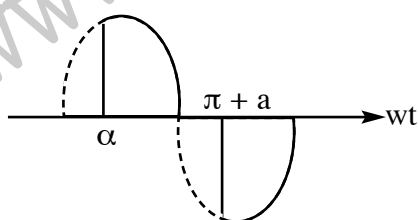
34. If the supply frequency and voltage applied to a synchronous motor are both reduced to fractions Kf , KV the maximum power of the motor becomes

- a) K times of P_{max} at ' f '
- b) $\frac{1}{K}$ times of P_{max} at f
- c) K^2 times of P_{max} at f
- d) $\frac{1}{K^2}$ times of P_{max} at f

35. For a salient pole synchronous machine, when the speed becomes super synchronous, during hunting, the damper bars develop

- a) synchronous motor torque
- b) dc motor torque
- c) induction motor torque
- d) induction generator torque

36. The output waveform given below can be obtained from



- a) controlled rectifier
- b) AC chopper
- c) DC chopper
- d) DIAC TRIAC phase control circuit

37. The candle power of a lamp placed normal to a working plane is 30 C.P. Find the distance if the illumination is 15 lux

- a) 2m b) 0.5m c) 1.414 m d) $\frac{1}{\sqrt{2}}$ m

38. The luminous intensity of a lamp is 750 C.P. Then the flux given out is

- a) $\frac{750}{\pi}$ lumen b) 750π lumen c) $\frac{750}{2\pi}$ lumen d) 1500π lumen

39. Furnaces used for electric crematorium are of type

- a) Resistance heating b) Induction heating
c) Dielectric heating d) Arc heating

40. For the same rating the amount of radiant heat produced is least in

- a) fluorescent lamp b) filament lamp
c) sodium vapour lamp d) mercury vapour lamp

41. In electric traction, the friction at the track is proportional to

- a) $\frac{1}{\text{speed}}$ b) $\frac{1}{(\text{speed})^2}$ c) speed d) $(\text{speed})^2$

42. Polar form of $(1 - a^2 + a)$ is

- a) $1.732 \angle 150$ b) $2 \angle -60$ c) $1.732 \angle -150$ d) $2 \angle 60$

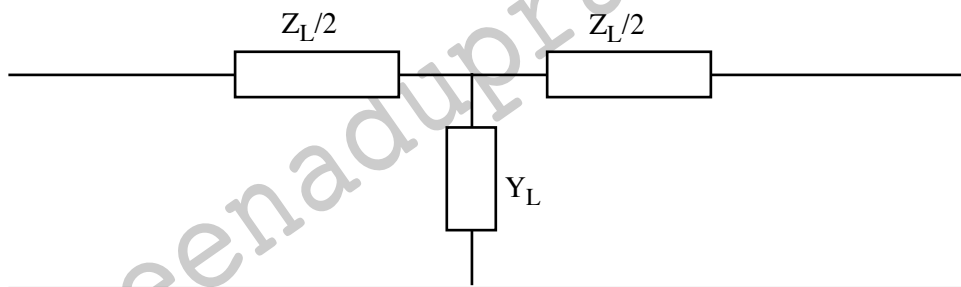
43. The number of strands on a 3 layer cable is

- a) 24 b) 7 c) 37 d) 19

44. Given maximum power transmitted through a line P_{max} , then with 60% of series capacitor compensation the maximum power transfer becomes

- a) $\frac{P_{max}}{0.4}$ b) $0.4 P_{max}$ c) $\frac{P_{max}}{0.6}$ d) $0.6 P_{max}$

45. In A, B, C, D parameters, $\frac{Z_L}{2}$ in the T-equivalent shown can be represented as



- a) $(A - 1)C$ b) $(A - 1)B$ c) $(A - 1)/C$ d) $B/(A - 1)$

46. An industrial consumer has a load of 1500 kw at 0.8 pf lag for 12 hrs and 1000 kw at Upf for 12 hours during a day. the Daily load factor of the consumer is

- a) 0.666 b) 0.833 c) 0.8 d) 1.25

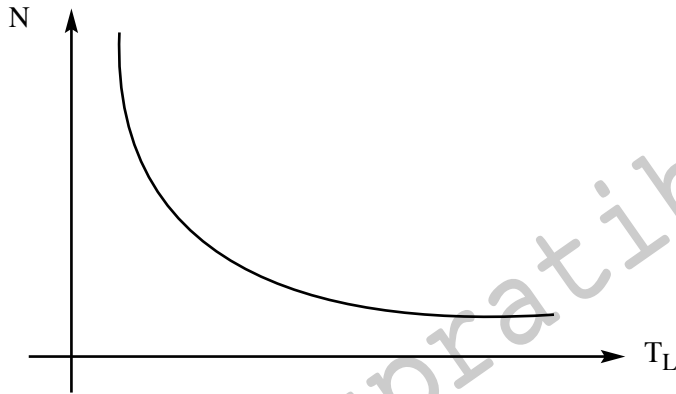
47. In a power system with negligible resistance, the fault current at a point is 8.0 pu. The series reactance to be connected at the fault point to reduce the short circuit current to 5.0 pu is

- a) 3.0 pu b) 0.25 pu c) 0.075 pu d) 0.125 pu

48. Merz price protection is more suitable for

- a) transformers
- b) generators
- c) transmission lines
- d) loads

49. The load torque vs speed characteristic of an industrial load is given below



The motor suitable for the above load is

- a) dc shunt motor
- b) 3 phase induction motor
- c) dc series motor
- d) capacitor motor

50. Between 2 supports, due to sag, the conductor takes the shape of

- a) parabola
- b) hyperbola
- c) catenary
- d) semicircle

51. In suspension type insulator, the potential drop is maximum across

- a) top disc
- b) centre disc
- c) lowest disc
- d) depends on number of discs of the string

52. The chances of occurrence of corona is maximum during

- a) dry weather
- b) humid weather
- c) winter
- d) hot summer

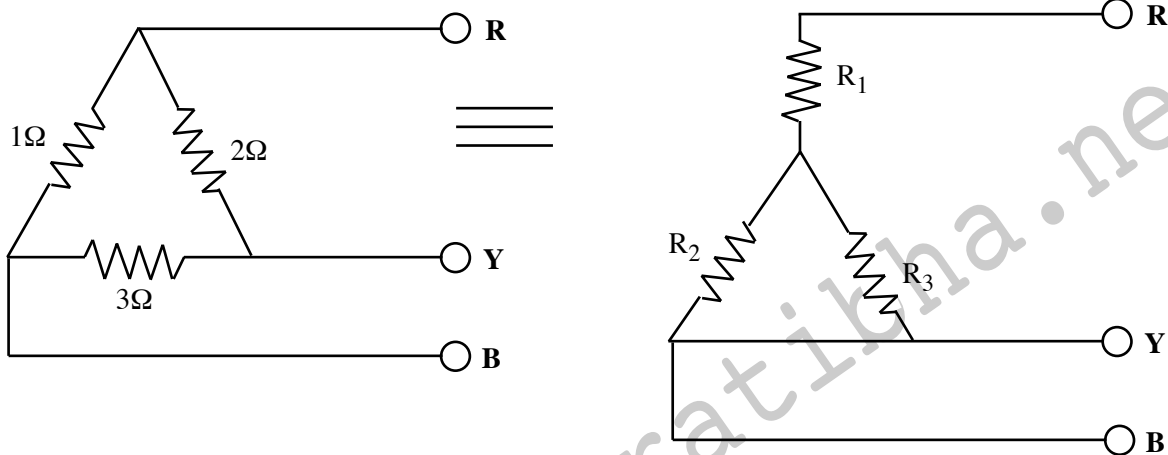
53. Equal area criterion can be applied to

- a) Multi machine systems
- b) to any system with any number of loads and generators
- c) single machine connected to infinite bus system
- d) system with induction machines

54. An ideal current source has zero

- a) internal conductance
- b) internal resistance
- c) voltage on no load
- d) ripple

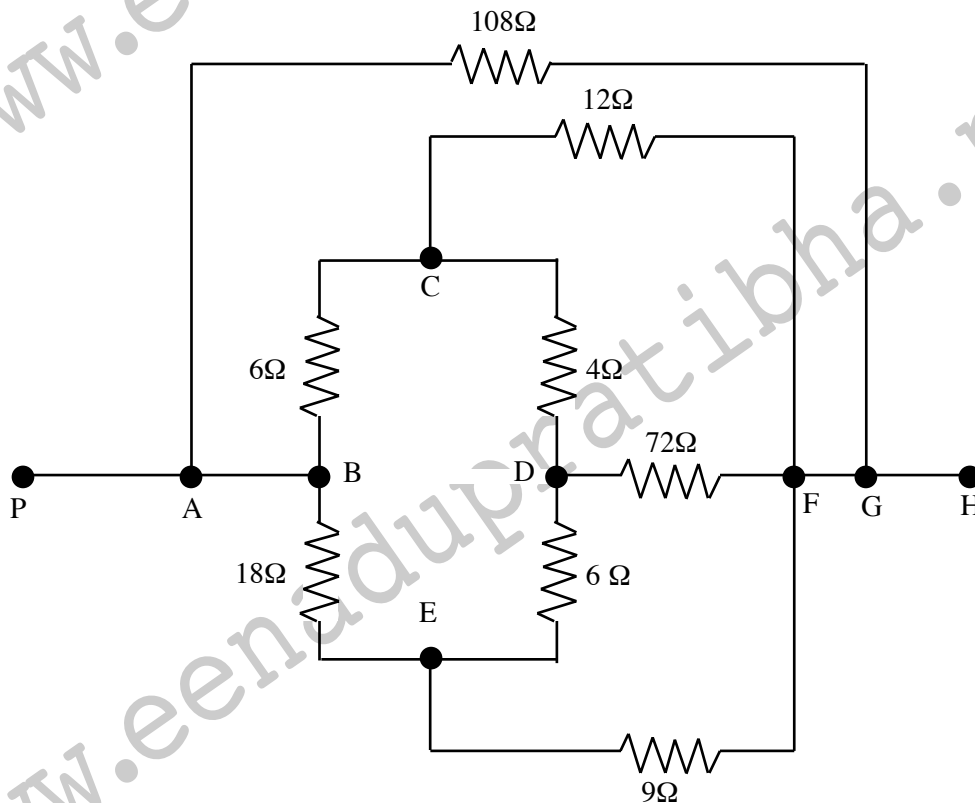
55. Three resistances of 1 ohm, 2 ohms and 3 ohms are connected in delta. These resistance are to be replace by star connection as shown in the figure below, maintaining the same terminal conditions.



The value of highest resistance in star will be

- a) $\frac{1}{4}$ ohm b) $\frac{1}{3}$ ohm c) $\frac{1}{2}$ ohm d) 1 ohm
56. Superposition theorem required as many circuits to be solved as there are
- a) sources b) nodes
c) sources + nodes d) sources + nodes + meshes

57.



The circuit shown above can be easily solved by

- a) Series parallel network
b) Star mesh theorem
c) Thevenin's theorem
d) Reciprocity theorem

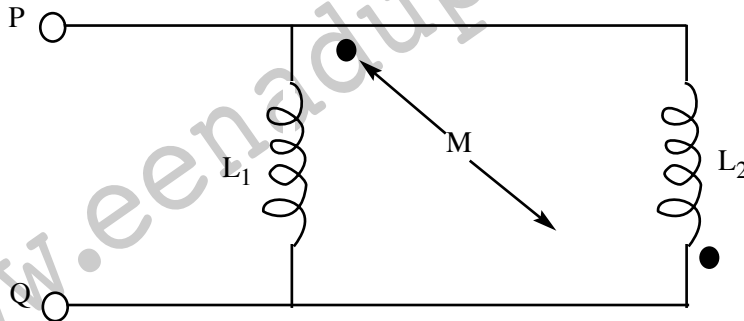
58. At Half power frequencies, the current in the RLC series circuit is

- a) $\frac{1}{\sqrt{2}}$ × current at resonance b) $\frac{1}{\sqrt{2}}$ × Current at resonance
 c) $\frac{1}{\sqrt{4}}$ × current at resonance d) $\frac{1}{\sqrt{3}}$ × current at resonance

59. In RLC circuits, the current at resonance is

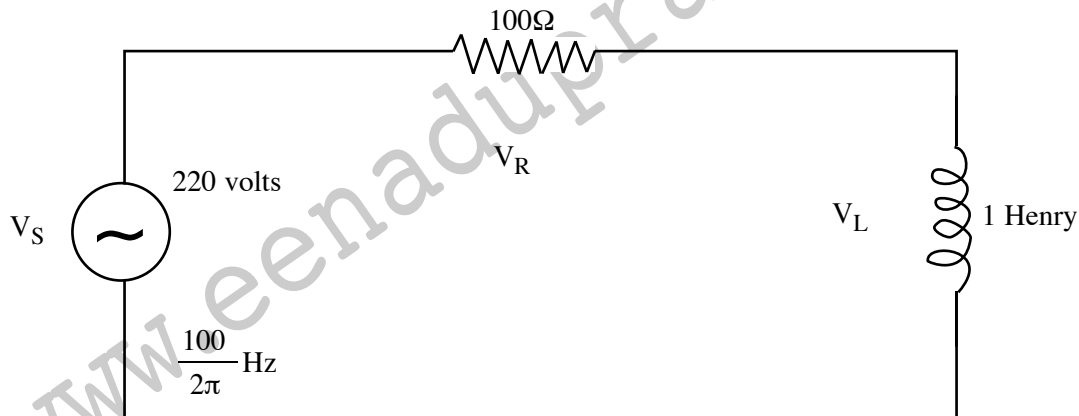
- a) maximum in parallel resonance and minimum in series resonance
 b) maximum in series resonance and minimum in parallel resonance
 c) maximum in both series and parallel resonance
 d) maximum in both series and parallel resonance

60. The equivalent inductance of the circuit between terminals P and Q is equal to



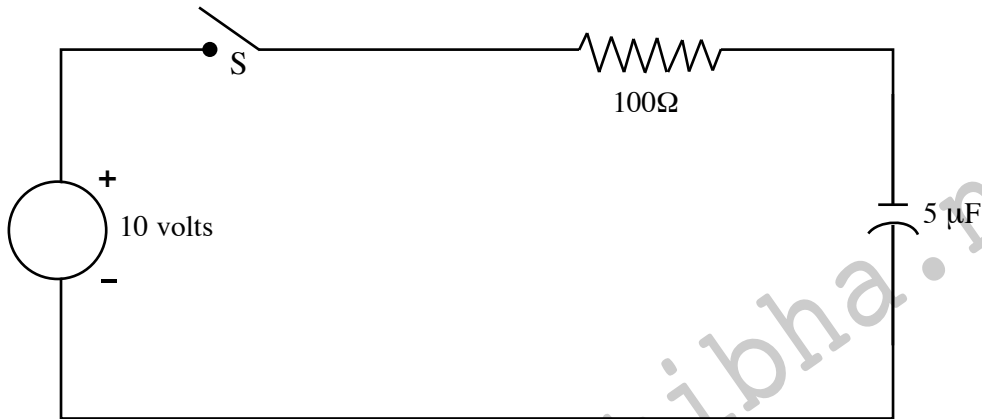
- a) $\frac{(L_1 + L_2 + 2M)}{(L_1L_2 - M^2)}$ b) $\frac{(L_1 + L_2 - 2M)}{(L_1L_2 - M^2)}$
 c) $\frac{(L_1L_2 - M^2)}{(L_1 + L_2 + 2M)}$ d) $\frac{(L_1L_2 - M^2)}{(L_1 + L_2 - 2M)}$

61. In the given circuit below, the voltage across the inductor is



- a) $\frac{220}{\sqrt{2}}$ volts b) $220\sqrt{2}$ volts
 c) 220 volts d) 110 volts

62. In the given R-C circuit, the current reaches its maximum value

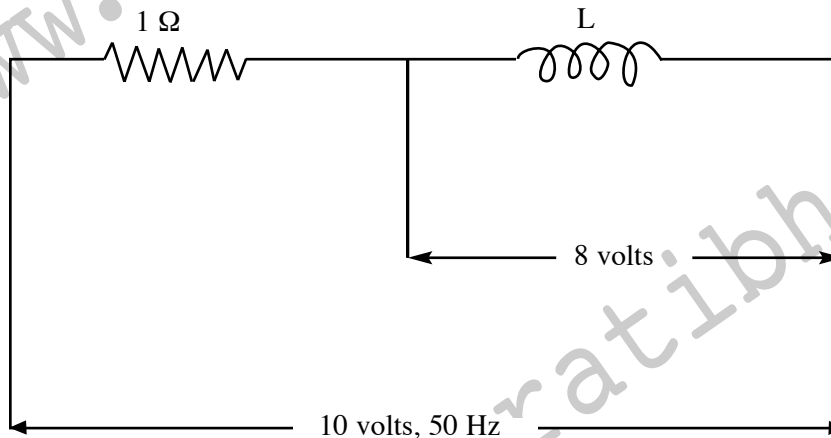


- a) After 50μ sec. of turning on the switch S
- b) after 100μ sec. of turning on the switch S
- c) after 1000μ sec. of turning on the switch S
- d) immediately after turning on the switch S

63. The time constant of a series R-L circuit is given by

- a) L^2R
- b) LR^2
- c) LR'
- d) $\frac{L}{R}$

64. For the circuit given below, the current through 1 ohm resistor will be



- a) 2 amps
- b) 4 amps
- c) 6 amps
- d) 8 amps

65. Admittance is the reciprocal of

- a) impedance
- b) inductance
- c) susceptance
- d) reactance

66. The power expression in 3-phase circuit in terms of line voltage V_L , line current I_L and power factor of the load is $\sqrt{3} V_L I_L \cos \phi$ where ϕ is the angle between

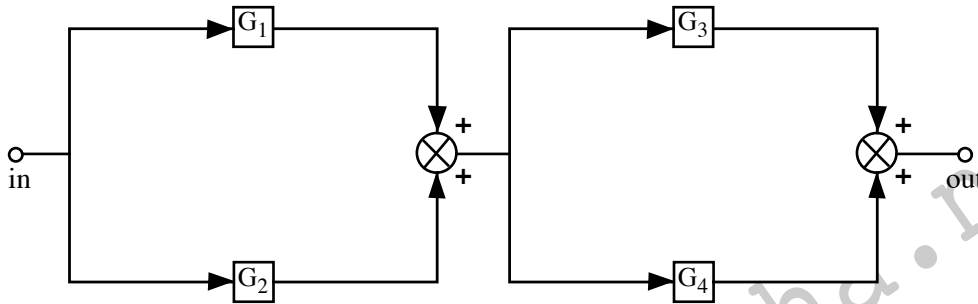
- a) line voltage and line current
- b) line voltage and phase current
- c) phase voltage and line current
- d) phase voltage and phase current

67. The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{K}{s(s + 1)}$

If the gain K is increased to infinity then the damping ratio will tend to become

- a) $\frac{1}{\sqrt{2}}$
- b) 1
- c) 0
- d) ∞

68. The overall gain for the block diagram shown below is given by



- a) $G_1 G_2 G_3 G_4$
- b) $G_1 + G_2 + G_3 + G_4$
- c) $G_1 G_2 + G_3 G_4$
- d) $(G_1 + G_2) \times (G_3 + G_4)$

69. Which of the following systems does have the tendency to oscillate?

- a) closed loop system
- b) open loop system
- c) either (A) or (B)
- d) both (A) and (B)

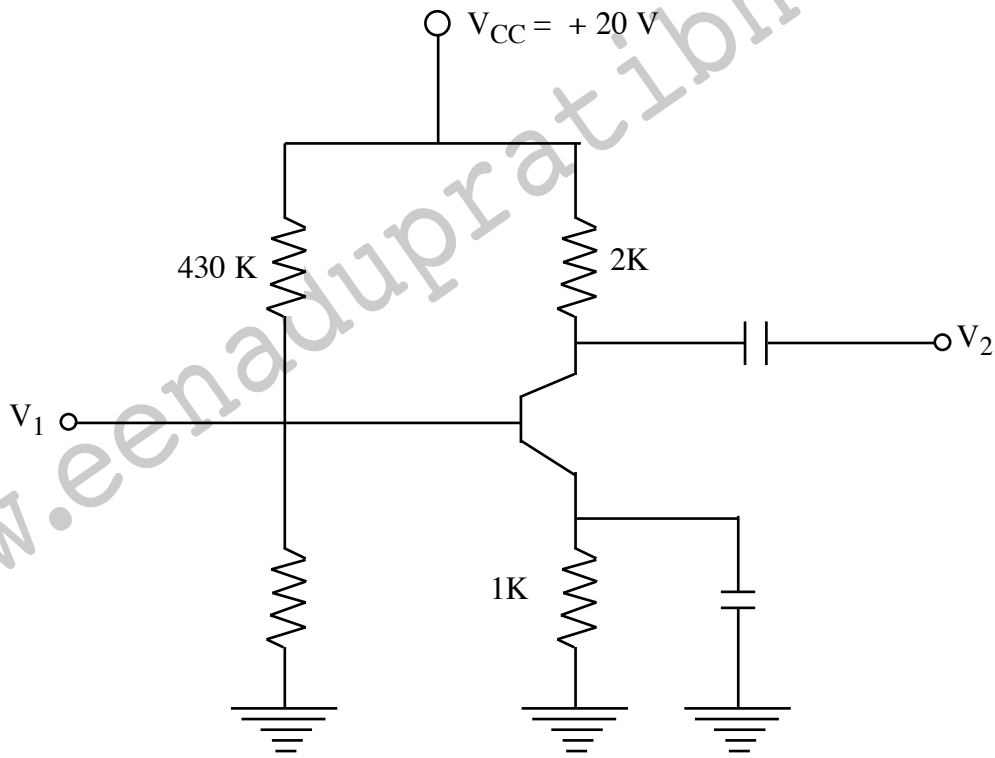
70. The feedback system with characteristics equation $s^4 + 2Ks^3 + s^2 + 5s + 5 = 0$ is

- a) unstable for all values of K
- b) stable for all values of K
- c) stable for positive values of K
- d) stable for zero value of K

71. For making an unstable system as stable system

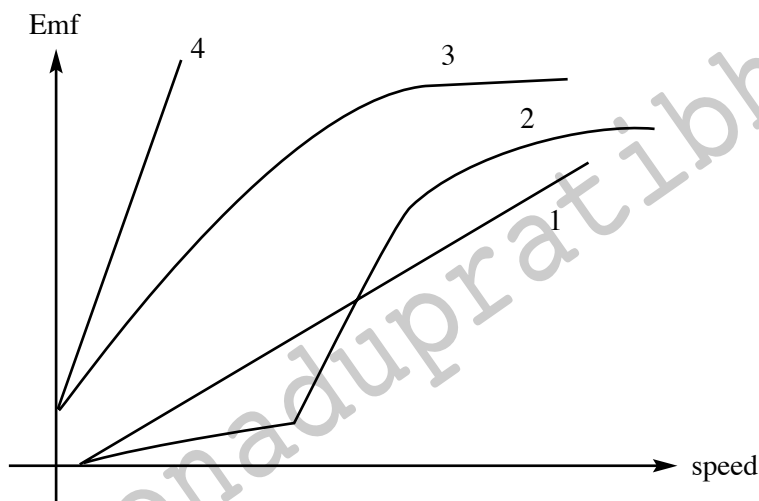
- a) gain of the system should be decreases
- b) gain of the system should be increases
- c) the number of zeros of the loop transfer function should be decreased
- d) the number of poles of the loop transfer function should be increased

72. For the BJT shown in figure, $V_{BE} = 0.7V$ $\beta = 100$, find I_B



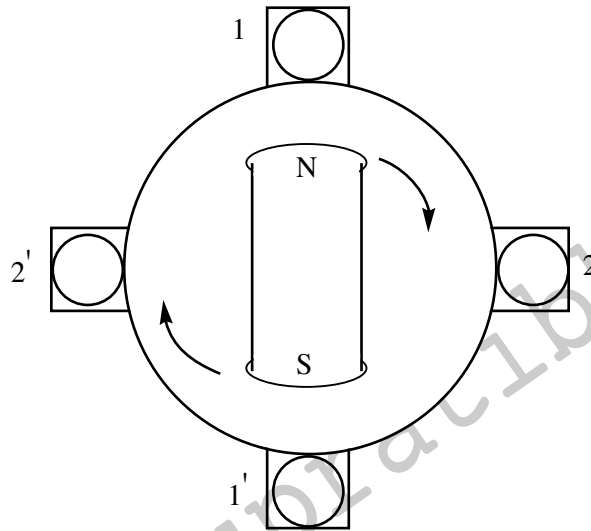
- a) $36.35 \mu A$
- b) 19.3 mA
- c) 38.6 mA
- d) $57 \mu A$

73. The value of transconductance at a bias voltage of 0V for the JFET which is having $I_{DSS} = 9 \text{ mA}$ and $V_P = -3\text{V}$ is
 a) 6 mV b) 6mS c) 27 S d) 3 mS
74. The efficiency of a class B amplifier for a supply voltage $V_{CC} = 24 \text{ V}$ with peak to peak output of 6V is
 a) 4% b) 48% c) 19.6% d) 39.2%
75. The ripple voltage of a FWR with a 100 μF filter capacitor connected to a load of 50 mA is
 a) 2.4 V b) 1.2 V c) 4.4 V d) 6.6 V
76. The timing resistor is 10 $\text{k}\Omega$ and timing capacitor is 200 PF for a 565 PLL. The free running frequency is
 a) 500 KHz b) 350 KHz c) 250 KHz d) 150 KHz
77. A dc motor is driving a load that requires constant output power. The pu value of torque with its field current reduced to half would be (consider rated quantities as 1.0 pu)
 a) 0.5 pu b) 1.0 pu c) 2.0 pu d) 1.5 pu
78. A 2-pole wave wound dc generator has 120 conductors in each parallel path of its armature. If it is driven at 1200 rpm and excited to have 0.02 wb/pole, the induced emf would be
 a) 48 V b) 96 V c) 24 V d) 124 V
79. The variation of open circuit emf of a separate excited generator when $I_f = \text{constant}$ and variable speed would be



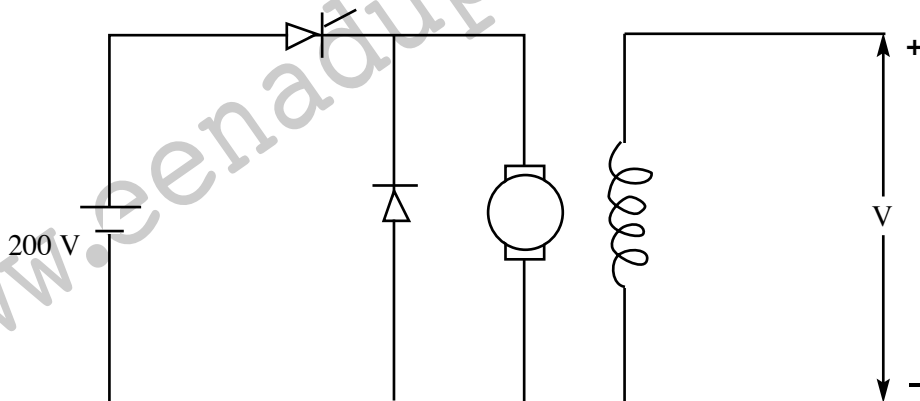
- a) 1 b) 2 c) 3 d) 4
80. A 220V/12-0-12V transformer has an emf/turn of 1V. The number of turns on secondary would be
 a) 12 with centre tap b) 220 with centre tap
 c) 24 with no centre tap d) 24 with centre tap
81. An ideal transformer has $N_1 = 100$ turns $N_2 = 200$ turns with a mutual flux of $\phi_m(t) = -0.05 (t^2 - 2t)$. The induced emf of secondary in volts is
 a) $-5 (t - 1)$ b) $-10 (t - 1)$
 c) $-5 (t^2 - 1)$ d) $-20 (t - 1)$

82. Four conductors in a stationary armature (alternator) are shown as 1, 1', 2, 2'. For the given direction of rotation of rotor the direction of induced emf (at the instant shown) in the conductors respectively



- | | | | |
|------------------|----|------------------|----|
| Conductor 1 | 1' | 2 | 2' |
| a) ⊗ ⊙ ○ ○ | | B) ○ ○ ⊗ ⊙ | |
| c) ⊗ ⊙ ⊗ ⊙ | | d) ⊙ ⊗ ⊙ ⊗ | |

83. A synchronous machine has $X_s = 1$ pu and operates at $V = 1$ pu. When its emf is 1.5 pu with load angle 0° , current as $(0 + j0.5)$, the mode of operation is
- a) generator with lagging pf b) generator with leading pf
 c) motor with lagging pf d) motor with leading pf
84. A 3-phase, 16 pole, 108-slot alternator will have the following phase grouping in each phase with 60° phase spread
- a) 2, 2, 2, 2 coil in basic unit of 4 poles
 b) 3, 2, 2, 2 coil in basic unit of 4 poles
 c) 3, 2, 2, 2 coils in basic unit of 16 poles
 d) 2, 2, 2, 2 coils in basic unit of 8 poles
85. For the power circuit given below. SCR is operated at 1 kHz with T_{ON} of 0.5 m sec.

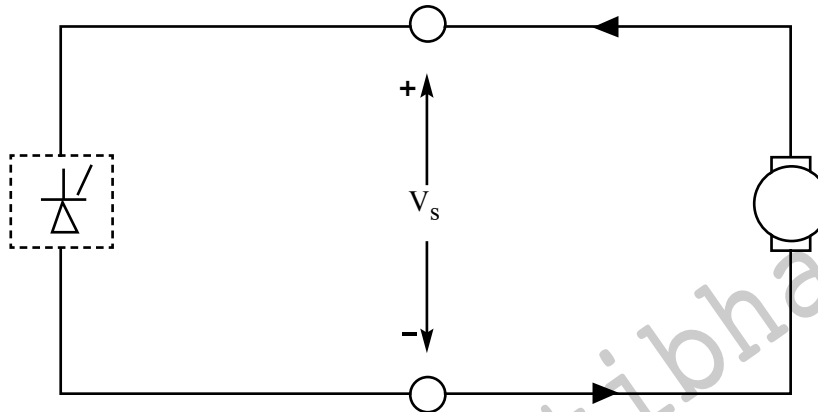


Motor ratings: 200 V dc, 1000 rpm, 10A

Neglecting armature resistance the speed of motor at given duty circle (TN - constant)

- a) 1000 rpm b) 500 rpm c) 1500 rpm d) 750 rpm

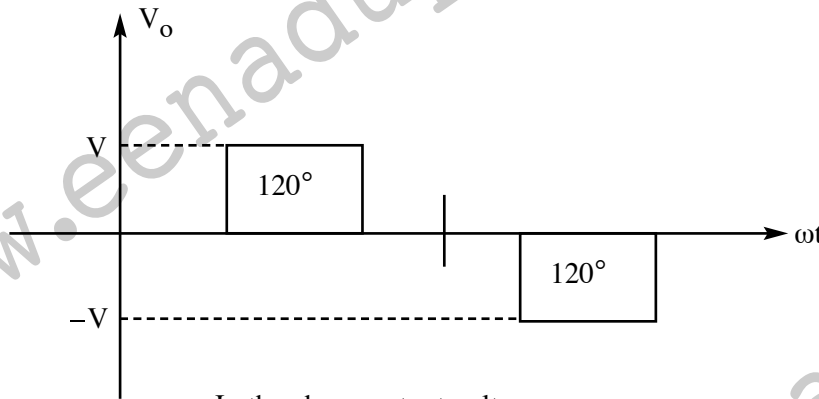
86. A converter is feeding a dc machine as shown below:



A mode of operation of machine is

- a) Motoring
- b) Regenerating
- c) Plugging
- d) Rheostatic braking

87. The output of a single phase inverted bridge is as given below:



In the above output voltage

- a) 5th and 7th harmonics will be absent
- b) 3rd, 5th, 7th harmonics will be absent
- c) 3rd, 9th, 15th harmonics will be absent
- d) 3rd and 7th harmonics will be absent

88. A 4 pole turbo generator rated 500 MVA, 22KV has its angular acceleration 437.8 ele. degrees/sec². It is equivalent to

- a) 1500 rpm/sec.
- b) 36.48 rpm/sec.
- c) 145.92 rpm/sec
- d) 72.97 rpm/sec

89. A 50 HZ generator having H = 6 MJ/MVA is connected to synchronous motor having H = 4 MJ/MVA through a network of reactances. The generator is delivering power of 1.0 pu to the motor which reduces to 0.6 pu when fault occurs. The angular acceleration in ele. degrees /sec² is

- a) 360
- b) 180
- c) 1500
- d) 1800

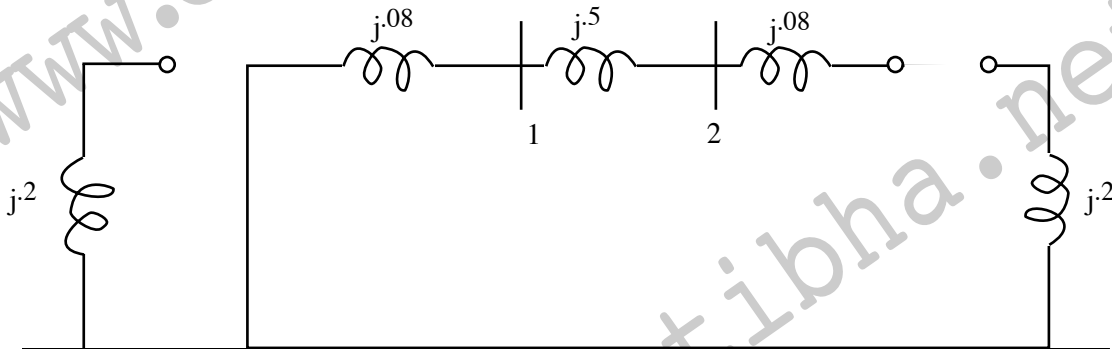
90. Synchronizing power coefficient can be written as

- a) $P_a \cdot \cos \delta_0$
- b) $P_{max} \cdot \cos \delta_0$
- c) $P_e \cdot \cos \delta_0$
- d) $P_{max} \cdot \sin \delta_0$

91. The relay that most likely to operate during power swings is

- a) Reactance relay
- b) Impedance relay
- c) Mho relay
- d) Bucholtz's relay

92. An OCB is rated 1500 A, 2000 MVA 33kV. Its making current is kA is
 a) 51.51 b) 35 c) 89.25 d) 154.54
93. The rating of lightning arrester used for 220 kv, 3 phase system is
 a) 220 kV, 10 kA b) 220 kV, 5 ka c) 198 kV, kA d) 198 kV, 2 kA
94. A generating station has maximum demand of 30 MW, a load factor of 0.6 and plant capacity factor 0.48. The reserve capacity of the plant is
 a) 37.5 MW b) 7.5 MW c) 19.5 MW d) 12 MW
95. A transformer of 10 MVA, 33 kV has reactance 0.1 pu. On 20 MVA, 11 kV the new pu value is
 a) 0.45 b) 1.8 c) 1.2 d) 0.6
96. In which type of fault, zero sequence currents are absent
 a) L-L b) L-G c) L-L-G d) L-L-L-G
97. In a single machine connected to infinite bus bar system, alternator voltage is 1.5 pu and its reactance is 1.0 pu are connected through a line reactance of 0.3 pu. The maximum steady state power transfer is
 a) 1.154 pu b) 5.0 pu c) 1.5 pu d) 0.76 pu
98. Value of acceleration factor used in Gauss Seidal method in load flow studies is
 a) 1.59 b) 1.66 c) 1.0 d) 1.6
99. The Z-bus of the following system of impedances



- a) $\begin{bmatrix} j0.08 & j0.5 \\ j0.5 & j0.58 \end{bmatrix}$ b) $\begin{bmatrix} j0.08 & j0.08 \\ j0.8 & j0.58 \end{bmatrix}$ c) $\begin{bmatrix} j0.08 & -j0.5 \\ -j0.5 & j0.58 \end{bmatrix}$ d) $\begin{bmatrix} j0.08 & -j0.08 \\ -j0.08 & j0.58 \end{bmatrix}$

100. An over current relay having a current setting of 125% is connected to a supply circuit through a current transformer of ratio 400/5. The pick up value will be
 a) 6.25 A b) 500 A c) 100 A d) 80A

ANSWERS

1-c; 2-d; 3-c; 4-b; 5-a; 6-b; 7-b; 8-a; 9-b; 10-d; 11-c; 12-d; 13-d; 14-b; 15-c; 16-c; 17-b; 18-d; 19-c; 20-a; 21-b; 22-b; 23-b; 24-c; 25-d; 26-d; 27-a; 28-c; 29-c; 30-a; 31-a; 32-c; 33-a; 34-a; 35-d; 36-d; 37-c; 38-d; 39-d; 40-a; 41-a; 42-d; 43-c; 44-c; 45-c; 46-b; 47-c; 48-b; 49-c; 50-c; 51-c; 52-b; 53-c; 54-a; 55-d; 56-d; 57-b; 58-b; 59-b; 60-c; 61-a; 62-a; 63-d; 64-c; 65-a; 66-a; 67-c; 68-b; 69-a; 70-c; 71-d; 72-a; 73-d; 74-c; 75-b; 76-?; 77-a; 78-a; 79-a; 80-c; 81-d; 82-a; 83-d; 84-b; 85-b; 86-b; 87-c; 88-b; 89-c; 90-b; 91-c; 92-d; 93-c; 94-?; 95-b; 96-a; 97-b; 98-d; 99-b; 100-a.