APEPDCL
AE

Previous Year Paper
2019

Q.P. Booklet Code : B

Q. P. Booklet Number : 20542

Time : 3 Hours

PDL19-I

Hall Ticket Number (To be filled-in by the Candidate)

Signature of the Candidate

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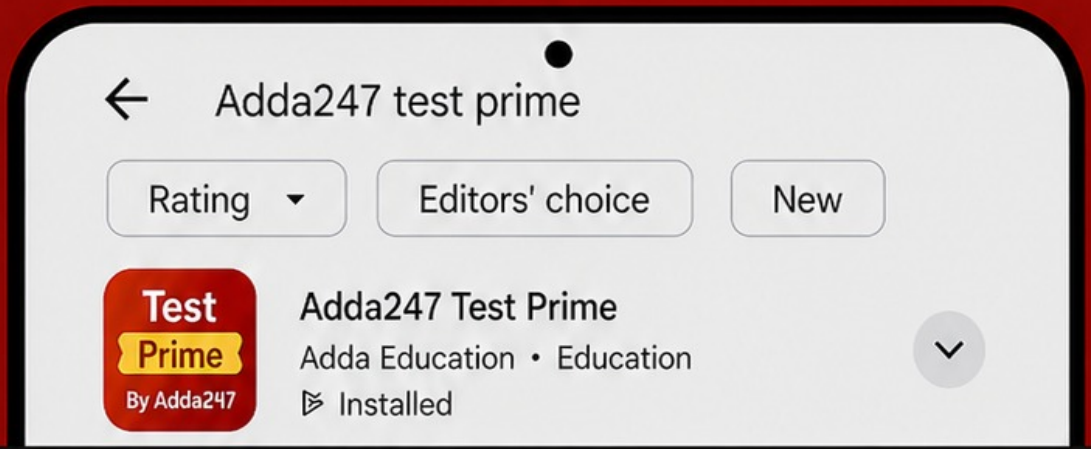

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1. A bridge circuit works at a frequency of 2 kHz. Which of the following can be used as null detector in such a bridge?
   (1) Headphones and tunable amplifiers
   (2) Vibration galvanometers and headphones
   (3) Amplifiers only
   (4) Vibration galvanometers and tunable amplifiers

2. Which of the following is the best example of zero order instrument?
   (1) Potential divider
   (2) Force-measuring spring scale
   (3) Thermocouple
   (4) Mercury thermometer

3. The source of emission of electrons in a CRT is ________.
   (1) Barium and strontium oxide coated cathode
   (2) Accelerating anodes
   (3) Post-accelerating anodes
   (4) PN junction diode

4. Which of the following is a dynamic characteristic of an instrument?
   (1) Fidelity (2) Resolution (3) Threshold (4) Hysteresis

5. For a given PMMC ammeter, the pointer deflects by an angle of 90° for a current of 10 mA. Due to ageing effect, the spring constant is reduced by 10%. What is the value of deflection for 5 mA current?
   (1) 81° (2) 45° (3) 50° (4) 90°

6. The input impedance of a CRO is nearly ________.
   (1) 10 Ω (2) 100 Ω (3) 1 MΩ (4) 0 Ω

7. When a PD controller is used in a system which of the following is affected?

(1) Type of the system (2) Steady state error

(3) Natural frequency (4) Damping ratio

8. If the transfer function of phase lead compensator is $\frac{s+a}{s+b}$ and that of a lag compensator is $\frac{s+p}{s+q}$, then which of the following conditions is satisfied?

(1) $a > b$ and $p > q$ (2) $a < b$ and $p < q$

(3) $a < b$ and $p > q$ (4) $a > b$ and $p < q$

9. For a feedback control system of type 2, the steady state error for a ramp input is _____.

(1) constant (2) zero

(3) indeterminate (4) infinite

10. Match List I with List II and select the correct answer :

List I	List II
(a) Synchro	(i) Amplifier
(b) Amplidyne	(ii) Activator
(c) Servo	(iii) Compensator
(d) RC Network	(iv) Transducer

(1) (a – iv) (b – iii) (c – ii) (d – i) (2) (a – iii) (b – ii) (c – iv) (d – i)

(3) (a – iv) (b – i) (c – ii) (d – iii) (4) (a – i) (b – ii) (c – iii) (d – iv)

11. Consider the unit-step response of a unity-feedback control system whose open loop transfer function is $G(s) = \frac{1}{s(s+1)}$. The maximum overshoot is equal to _____.

(1) 0.153 (2) 0.163 (3) 0.173 (4) 0.143

12. A system is described by the state equation $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$. The state transition matrix of the system is _____.

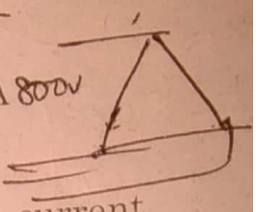
(1) $\begin{bmatrix} e^{-2t} & 0 \\ 0 & e^{-2t} \end{bmatrix}$ (2) $\begin{bmatrix} e^{2t} & 1 \\ 1 & e^{2t} \end{bmatrix}$ (3) $\begin{bmatrix} e^{-2t} & 1 \\ 1 & e^{-2t} \end{bmatrix}$ (4) $\begin{bmatrix} e^{2t} & 0 \\ 0 & e^{2t} \end{bmatrix}$

13. A unity feedback system has the open loop transfer function $G(s) = \frac{1}{(s-1)(s+2)(s+3)}$. How many times the Nyquist plot of G(s) encircles the origin?

(1) Never (2) Twice (3) Thrice (4) Once

14. A balanced delta connected load draws 20 kW at a power factor 0.8 leading. If the line voltage is 800 V rms, the magnitude of rms value of line current will be

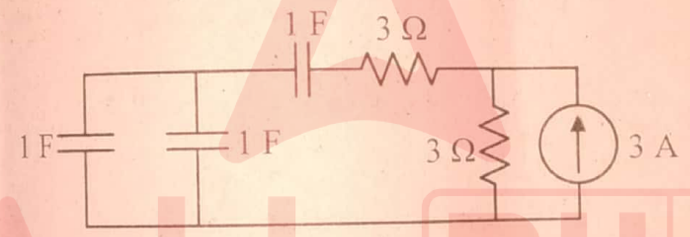
(1) 18.04 A (2) 25 A (3) 14.43 A (4) 13.25 A



15. The average power delivered to an impedance $(4 - j3)\ \Omega$ by a current $5\cos(100\pi t + 100)$ A is _____.

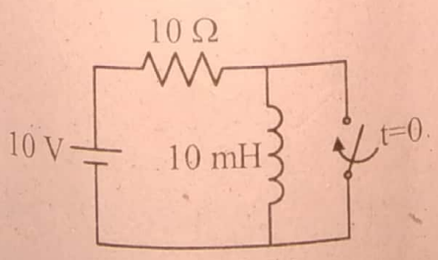
(1) 50 W (2) 62.5 W (3) 125 W (4) 44.2 W

16. The time constant for the given circuit will be _____.



(1) 1/4 s (2) 4 s (3) 9 s (4) 1/9 s

17. The circuit shown in the figure is in steady state. When the switch is closed at t = 0, assuming that the inductance is ideal, the current through the inductor at $t = 0^+$ is equal to _____.



(1) 0.5 A (2) 1 A (3) 2 A (4) 0 A

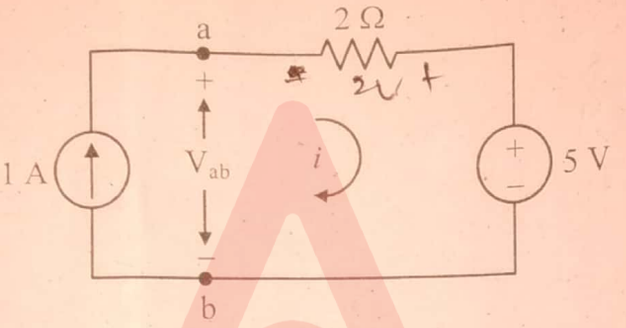
18. If each branch of a delta circuit has impedance of $\sqrt{3}Z$, then each branch of equivalent star circuit has an impedance _____.

(1) $3Z$ (2) $3\sqrt{3}Z$ (3) $Z/3$ (4) $Z/\sqrt{3}$

19. The Z matrix of a two port network is given by $\begin{bmatrix} 4 & 3 \\ 3 & 6 \end{bmatrix}$. The element Y_{22} of the corresponding Y matrix of the same network is given by _____.

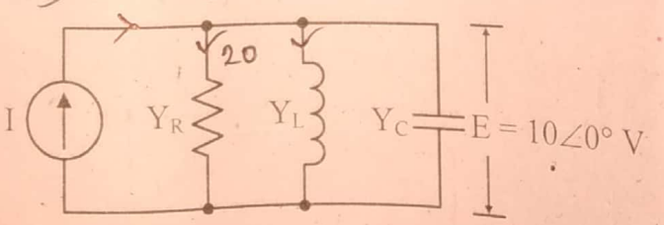
(1) 0.267 (2) −0.267 (3) 0.42 (4) 0.5

20. Assuming ideal elements in the circuit shown below, the voltage V_{ab} will be



(1) 0 V (2) 3 V (3) 5 V (4) −3 V

21. In the figure, the admittance values of the elements in Siemens are $Y_R = 0.5 + j0$, $Y_L = 0 - j1.5$, $Y_C = 0 + j0.3$ respectively. What is the value of I as a phasor when the voltage E across the elements is $10 \angle 0°$ V?



(1) $5 - j18$ (2) $0.5 + j1.8$ (3) $5 - j12$ (4) $1.5 + j0.5$

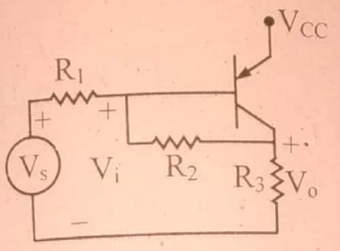
22. The lowest and highest critical frequencies of RC driving point impedance respectively are _____.

(1) a pole and a pole (2) a zero and a zero
(3) a pole and a zero (4) a zero and a pole

23. f_l is the lower half power frequency of a single stage amplifier. The lower half power frequency of n-stage amplifier is _____.

(1) $f_l\sqrt{2^{\frac{1}{n}}-1}$ (2) $\frac{f_l}{\sqrt{1-2^{\frac{1}{n}}}}$ (3) $f_l\sqrt{1-2^{\frac{1}{n}}}$ (4) $\frac{f_l}{\sqrt{2^{\frac{1}{n}}-1}}$

24. The given feedback amplifier topology is _____.



(1) voltage series (2) voltage shunt
(3) current shunt (4) current series

25. The frequency of oscillations of a symmetric astable multivibrator, given that R = 10 kΩ and C = 10 nF is _____.

(1) 14 kHz (2) 3.5 kHz (3) 28 kHz (4) 7 kHz

26. The β-network used in a Wien bridge oscillator employs R = 10 kΩ. C can be varied from 0.001 μF to 0.1 μF. The ratio of the maximum frequency to minimum frequency is _____.

(1) 10 (2) 50 (3) 150 (4) 100

27. A 6-bit DAC produces $V_0 = 0.25$ V for a input code of 000001. V_0 for the input code 111101 is _____.

(1) 30.50 V (2) 15.25 V (3) 2.5 V (4) 25 V

28. θ_{JA} of a power transistor is 2.5°C/W. $T_J = 25$°C. $P_{D(max)}$ at 150°C is _____.

(1) 75 W (2) 50 W (3) 150 W (4) 100 W

29. Bundled conductors are used for EHV transmission lines primarily for reducing the _____.

(1) I^2R loss
(2) voltage across the line
(3) corona loss
(4) surge impedance of the line

30. Corona loss increases with _____.

(1) decrease in supply frequency but increase in conductor size.
(2) decrease in supply frequency and reduction in conductor size.
(3) increase in supply frequency but reduction in conductor size.
(4) increase in supply frequency and increase in conductor size.

31. How much power is developed when a hydro power plant operates under an effective head of 30 m and a discharge of 40 m^3/sec?

(1) 11.77 MW (2) 0.1177 MW (3) 1177 MW (4) 117.7 MW

32. The Y-bus matrix of a 300 bus interconnected system is 80% sparse. Hence, the number of transmission lines in the system must be _____.

(1) 8850 (2) 35850 (3) 9000 (4) 36000

33. The corona loss on a particular system at 50 Hz is 1.2 kW/phase per km. The corona loss on the same system with supply frequency 60 Hz will be _____.

(1) 0.5 kW/phase/km
(2) 0.667 kW/phase/km
(3) 1.36 kW/phase/km
(4) 1 kW/phase/km

34. A sodium graphite reactor uses _____.

(1) sodium as coolant and graphite as moderator.
(2) a mixture of sodium and graphite as coolant.
(3) a mixture of sodium and graphite as moderator.
(4) sodium as moderator and graphite as coolant.

35. A string insulator has 4 units. The voltage across the bottom most unit is 33.33% of the total voltage. Its string efficiency is _____.

(1) 33.33% (2) 66.7% (3) 75% (4) 25%

36. Load compensation in power system is a process to _____.

(1) increase short circuit capacity of the system.

(2) generate required harmonics for loads like arc furnaces.

(3) compensate for the line reactance.

(4) maintain better voltage profile.

37. When small birds sit on an overhead transmission line, they don't get electrocuted. The reason is that, _____.

(1) birds' legs do not conduct electricity.

(2) negligible voltage is applied across the bird.

(3) the body-resistances of birds are very high.

(4) transmission lines are usually insulated.

38. In a load flow study, voltage limits are imposed at all the buses. In any iteration, if a load bus violates its voltage limit then it will be switched to _____.

(1) P-V bus (2) Reference bus (3) Swing bus (4) P-Q bus

39. A soft iron toroid, is concentric with a long straight conductor carrying a direct current I. The relative permeability μ_r of soft iron is 100. The ratio of the magnetic flux densities at two adjacent points located just inside and just outside the toroid is _____.

(1) 100 (2) 75 (3) 90 (4) 50

40. The ABCD parameters of a medium length line in nominal T configuration is _____.

(1) $A = D = 1 + \frac{YZ}{2}$, $B = Z\left(1 + \frac{YZ}{4}\right)$, $C = Y$

(2) $A = D = \frac{1 + YZ}{2}$, $B = Z$, $C = Y\left(1 + \frac{YZ}{4}\right)$

(3) $A = D = \frac{1 + YZ}{2}$, $B = Z\left(1 + \frac{YZ}{4}\right)$, $C = Y$

(4) $A = D = 1 + \frac{YZ}{2}$, $B = Z$, $C = Y\left(1 + \frac{YZ}{4}\right)$

41. For economic operation of generators in a thermal power plant all the units should operate _____.

(1) such that their fuel costs are same (2) at different incremental fuel costs

(3) at maximum efficiency (4) at the same incremental fuel cost

42. A single core cable having a conductor radius of 1 cm. What is the thickness of the insulator required so that the electric field stress on the surface of the conductor is minimum?

(1) 2 cm (2) 2.718 cm (3) 1.718 cm (4) 1 cm

43. The discs of the strain insulators are used in _____ plane.

(1) slant (2) vertical (3) smooth (4) horizontal

44. The operating time of the instantaneous relay will be in the order of _____.

(1) few milliseconds (2) few minutes

(3) few micro seconds (4) few nano seconds

45. For a power system network with 10 nodes, Z_{44} of its bus impedance matrix is j0.5 pu. The voltage at node-4 is $1.5\angle 2°$ pu. If a capacitor having a reactance of –j3.5pu is now added to the network between node-4 and the reference node, the current drawn by the capacitor in pu is _____.

(1) $0.5\angle 88°$ (2) $0.428\angle 92°$ (3) $0.428\angle 88°$ (4) $0.5\angle 92°$

46. How much coal is required to generate energy equivalent to the energy generated by 1 kg of uranium?

(1) 300 tonnes of high grade coal

(2) 10,000 tonnes of high grade coal

(3) 3,000 tonnes of high grade coal

(4) 30,000 tonnes of high grade coal

47. The demand factor for the electrical system is the ratio of _____.

(1) maximum demand to average load

(2) average power to maximum power

(3) relative power to total power

(4) maximum demand to connected load

48. A nuclear power plant is invariably used as a _____.

(1) peak load plant
(2) stand-by plant
(3) spinning reserve plant
(4) base load plant

49. For which of the following cases, the equal area criterion of stability can be used?

(1) Isolated alternator with load
(2) Many machines and infinite bus bar
(3) Isolated alternator without load
(4) One machine and infinite bus bar

50. Initially what will be the voltage at all the PQ buses for solving the load flow problem using NR method?

(1) $V_i = 1 \angle 0°$ (2) $V_i = 1 \angle 180°$ (3) $V_i = 1 \angle 45°$ (4) $V_i = 1 \angle 90°$

51. Which of the following will not effect the stability of the power system?

(1) Line losses
(2) Excitation of generators
(3) Load angle δ
(4) Generator reactance

$P = \frac{EV}{X_S} \sin\delta$

52. In what direction does the phasor gets rotated, if it is multiplied by the operator 'j'?

(1) Clockwise
(2) Gets rotated by 90° in the clockwise direction
(3) Gets rotated by 90° in the anticlockwise direction
(4) Anti clockwise

53. If the pu impedance of a single phase transformer is 0.01+j0.05, then its regulation at p.f. of 0.8 lagging will be _____.

(1) +2.2% (2) –3.8% (3) +3.8 % (4) –2.2 %

$0.01 \times 0.8 + 0.05 \times 0.6$

$\frac{8}{1000} + \frac{30}{100}$

54. The self GMD method is used to evaluate _____.

(1) capacitance
(2) inductance and capacitance
(3) resistance
(4) inductance

55. The slip of an induction motor is the ratio of _____.

(1) rotor copper loss to rotor input
(2) rotor copper loss to stator input
(3) rotor copper loss to rotor output
(4) stator copper loss to stator input

$P_{ag} : P_{rcl} : P_{op} = 1 : S : (1-S)$

$S = \frac{P_{rcl}}{P_{ag}}$

56. In the Y/Δ connection of three phase transformer, with respect to phase difference from primary to secondary, identify possible ways of Y/Δ connections

(I) ± 30° Y/Δ connection
(II) ± 60° Y/Δ connection
(III) ± 90° Y/Δ connection

(1) (II) and (III) are possible
(2) (I) and (II) are possible
(3) (I) and (III) are possible
(4) (I) is only possible

57. In repulsion motor, maximum torque is developed when _____.

(1) brush axis is at 90° electrical to the field axis
(2) brush axis is at 45° electrical to the field axis
(3) brush axis coincides with the field axis
(4) brush axis is at 180° electrical to the field axis

58. The function of commutator in the DC machine is to convert _____.

(I) voltage of armature from AC to DC in case of motor
(II) voltage of armature from AC to DC in case of generator
(III) voltage of armature from DC to AC in case of motor
(IV) voltage of armature from DC to AC in case of generator

(1) (I) and (II) are correct
(2) (II) and (III) are correct
(3) (III) and (IV) are correct
(4) (II) is correct

59. A 6-pole DC machine has duplex wave wound armature. The number of parallel current paths are _____.

(1) 12
(2) 2
(3) 4
(4) 6

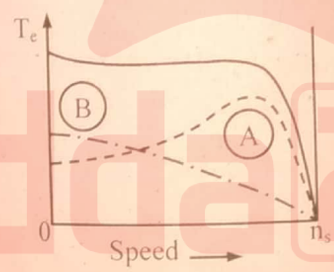
60. Which one of the following machines is a double-excited electrical machine?
(1) DC shunt motor
(2) Synchronous motor
(3) Induction motor
(4) DC series motor

61. Small air gap between stator and armature of a DC machine _____.
(1) provides high ventilation
(2) provide stronger magnetic field
(3) facilitate high speed operation
(4) reduces noise

62. When a 50Hz transformer is operating at 400 Hz, its kVA rating is _____.
(1) reduced to 1/8
(2) increased to 8 times
(3) determined by load on secondary
(4) unaffected

63. The total number of slots on the stator of a three phase 6-pole induction motor having 3 slots per pole per phase is _____.
(1) 18
(2) 27
(3) 54
(4) 9

64. The double cage induction motor torque-slip characteristics is shown in the following figure. Which of the following statements is correct?



(1) Curve 'A' is torque-slip characteristic of inner-cage rotor and resistance of A < B
(2) Curve 'B' is torque-slip characteristic of inner-cage rotor and resistance of B > A
(3) Curve 'B' is torque-slip characteristic of outer-cage rotor and resistance of B < A
(4) Curve 'A' is torque-slip characteristic of outer-cage rotor and resistance of A > B

65. Maximum torque developed by an induction motor when the phase difference between stator flux and rotor current is _____.
(1) 90° electrical
(2) 45° electrical
(3) 60° electrical
(4) 0° electrical

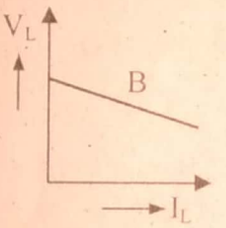
66. A starting torque of 80 Nm is developed in an induction motor by an autotransformer starter with a tapping of 30%. If the tapping of autotransformer is 60% then starting torque will be _____.

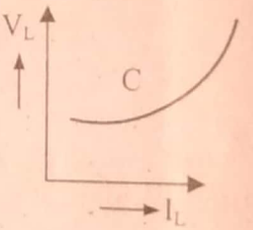
(1) 160 Nm (2) 240 Nm (3) 320 Nm (4) 40 Nm

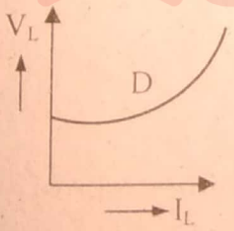
67. Two synchronous generators G_1 and G_2 are equally sharing the kVAR of the load while operating in parallel. Keeping the terminal voltage fixed in order to shift part of the kVAR load from G_2 to G_1 _____.

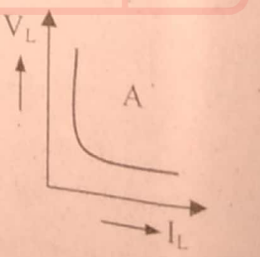
(1) the field current of g_2 is raised
(2) the field current of G_1 is raised and of G_2 lowered
(3) the field current of G_1 is lowered and of G_2 is raised
(4) the field current of g_1 is lowered

68. Which figure represents the load characteristic of DC shunt generator?

(1) 

(2) 

(3) 

(4) 

69. The main reason for connecting a pulse transformer at the output stage of a thyristor triggering circuit is to _____.

(1) provide electrical isolation
(2) reduce the turn on time of the thyristor
(3) avoid spurious triggering of the thyristor due to noise
(4) amplify the power of triggering pulse

70. A series motor is best suited for driving _____.

(1) cranes and hoists
(2) shears and punches
(3) machine tools
(4) lathes

71. If the peak value of phase mmf is F_{max}, then the peak value of the rotating field caused by three phases is _____

(1) F_{max} (2) $3F_{max}$ (3) $1.5\ F_{max}$ (4) $0.5\ F_{max}$

72. It is required to drive a DC shunt motor at different speeds in both the directions (forward and reverse) and also to brake it in both the directions. Which one of the following would you use?

(1) A full controlled thyristor bridge
(2) A diode bridge
(3) A dual converter
(4) A half controlled thyristor bridge

73. In a commutation circuit employed to turn off an SCR, satisfactory turn-off is obtained when _____.

(1) circuit turn-off time > device turn-off time
(2) circuit time constant > device turn-off time
(3) circuit time constant < device turn-off time
(4) circuit turn-off time < device turn-off time

74. Valve power rating of converter circuit is given by the product of _____.

(1) peak inverse voltage and r.m.s. value of current
(2) peak inverse voltage and average value of current
(3) maximum voltage and maximum current
(4) average voltage and average current

75. Opto-couplers are connected to the transistor base drive circuits because _____.

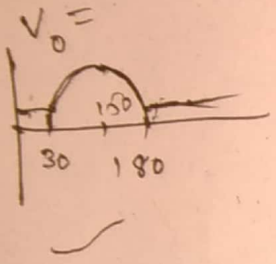
(I) amplification of base drive is required.
(II) fast switching of base drive is essential.
(III) isolation is required between control and base drive.
(IV) protection of base drive is essential.

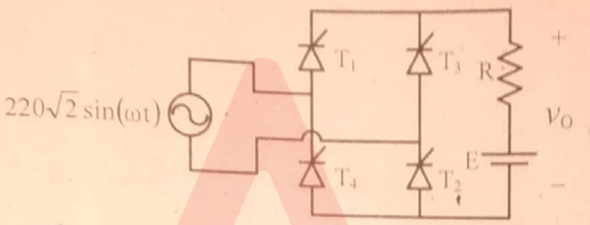
(1) (II) and (III) (2) (I) and (IV) (3) (II) and (IV) (4) (I) and (III)

76. A thyristor based half-wave rectifier is supplying a resistive load. The source voltage is $\sqrt{2}V_S \cos(\omega t)$. If the firing angle $\alpha = 60°$, the average load voltage is _____.

(1) $\frac{3V_S}{4\pi}$ (2) $\frac{\sqrt{2}V_S}{4\pi}$ (3) $\frac{\sqrt{2}V_S}{\pi}$ (4) $\frac{3\sqrt{2}V_S}{4\pi}$

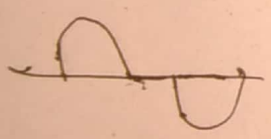
77. For the converter shown below, firing angle for thyristors T_1 and T_2 is $\pi/6$; firing angle for thyristors T_3 and T_4 is $5\pi/6$. If R = 10 Ω and E = 220V, the average voltage across the RE-load is _____.

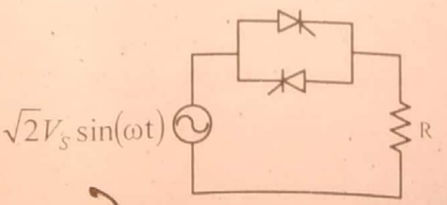




(1) $70\sqrt{6}$ V (2) $220\sqrt{2}$ V (3) $220(\sqrt{2}-1)$ V (4) 220 V

78. In the figure shown below, a thyristor based 1-ϕ voltage regulator with firing angle $\alpha = 90°$. The rms output voltage is _____.





(1) $\frac{V_S}{\pi}$ (2) $\frac{V_S}{\sqrt{2}}$ (3) $\frac{\sqrt{2}V_S}{\pi}$ (4) $\frac{V_S}{2}$

79. In DC chopper, per unit ripple is maximum when duty cycle α is _____.

(1) 1.0 (2) 0.7 (3) 0.5 (4) 0.2

80. Which of the following may be used for frequency measurement?

(1) Maxwell's bridge
(2) Wien bridge
(3) Schering bridge
(4) Kelvin's bridge

81. A guard terminal in measurement of high resistance is used to _____

(1) guard the resistance against overloads
(2) bypass the leakage current
(3) minimize the charging current in insulation capacitance
(4) guard the resistance against any stray electrostatic field

82. A manganin swamp resistance is connected in series with a moving coil ammeter consisting of a milliammeter and a suitable shunt in order to _____.

(1) obtain large deflecting torque
(2) reduce the size of the meter
(3) minimize the effect of stray magnetic fields
(4) minimize the effect of temperature variation

83. The Lissajous pattern on a CRO screen is shown in the figure. The frequency ratio of the vertical signal to the horizontal one is _____.

(1) 2 : 3 (2) 5 : 1 (3) 1 : 5 (4) 3 : 2

84. In case of single-phase induction type energy meter, maximum torque is achieved when the angle between two fluxes is _____.

(1) 45° (2) 90° (3) 180° (4) 0°

85. The primary current in a current transformer is dictated by _____.

(1) the core of the transformer
(2) load current
(3) turns ratio
(4) the secondary burden

86. While measuring power in a three phase load by two wattmeter method, the readings of two wattmeters will be equal and opposite when _____.

(1) load is balanced

(2) phase angle is between 60° and 90°

(3) load is purely inductive

(4) power factor is unity

87. The power of a n-phase unbalanced circuit can be measured by using a minimum of _____.

(1) n wattmeters

(2) (n + 1) wattmeters

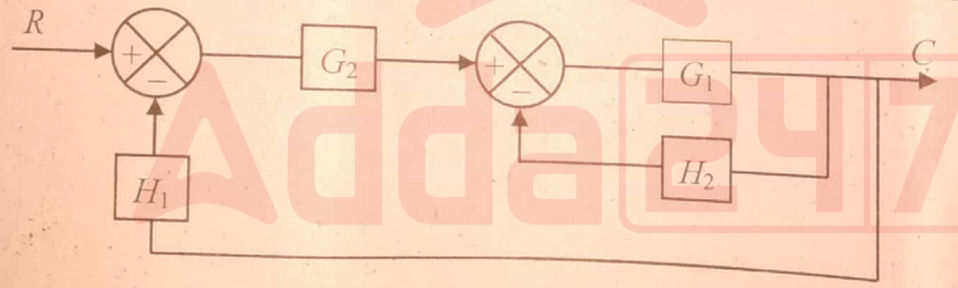
(3) (n – 2) wattmeters

(4) (n – 1) wattmeters

88. For a given frequency, the deflecting torque of an induction ammeter is directly proportional to _____.

(1) current^3 (2) $\sqrt{\text{current}}$ (3) current (4) current^2

89. The transfer function of the following system is given by _____.



(1) $\frac{G_1G_2}{1+G_2H_1+G_1G_2H_2}$

(2) $\frac{G_1H_1}{1+G_2H_1+G_1G_2H_2}$

(3) $\frac{G_2}{1+G_2H_1+G_1G_2}$

(4) $\frac{G_1G_2}{1+G_1H_2+G_1G_2H_1}$

90. A unity feedback system has $G(s)=\frac{40(s+2)}{s(s+1)(s+4)}$. The steady state error of the system with a ramp input of magnitude '5' is _____

(1) 0.25 (2) 0.3 (3) 0.4 (4) 0.2

91. If the unit step response of a network is $(1-e^{\alpha t})$, then its unit impulse response will be _____.

(1) $\alpha e^{-t/\alpha}$ (2) $1/(\alpha e^{-\alpha t})$ (3) $(1-\alpha)e^{-\alpha t}$ (4) $\alpha e^{-\alpha t}$

92. Natural frequency of a unity feedback control system of transfer function $G(s)=\frac{10}{s(s+1)}$ is _____.

(1) 0.5 rad/sec (2) 4.6 rad/sec (3) 2.3 rad/sec (4) 3.16 rad/sec

93. The closed loop transfer function of a control system is given by $\frac{C(s)}{R(s)}=\frac{2(s-1)}{(s+2)(s+1)}$. For a unit step input the output is _____

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

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

94. A unity feedback second order system is given by $G(s)=\frac{K}{s(Js+B)}$ where J = moment of inertia, K = system gain, B = viscous damping coefficient. The transient response specification which is NOT effected by the variation of system gain is _____.

(1) settling time (2) peak overshoot (3) damped frequency of oscillations (4) rise time

95. The number of roots of the equation $2s^4+s^3+3s^2+5s+7=0$ that lie in the right half of the s-plane is _____.

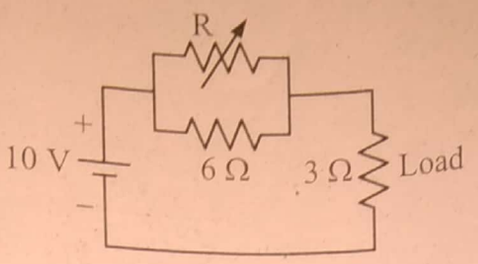
(1) one (2) two

(3) three (4) zero

96. In the Bode plot of a unity feedback control system, the value of phase of $G(j\omega)$ at the gain cross over frequency is $-125°$. The phase margin of the system is _____.

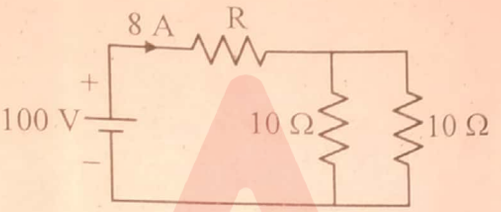
(1) $-55°$ (2) $55°$ (3) $125°$ (4) $-125°$

97. In the circuit given below, the value of R required for the transfer of maximum power to the load having a resistance of 3 Ω is _____.



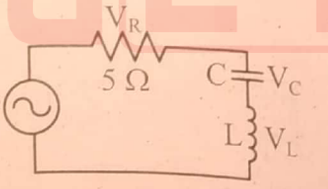
(1) 3 Ω (2) 6 Ω (3) 2 Ω (4) zero

98. In the figure given below, the value of R is _____.



(1) 5.0 Ω (2) 7.5 Ω (3) 10.0 Ω (4) 2.5 Ω

99. In the circuit of the figure, the magnitudes of V_L and V_C are twice that of V_R. Given that f = 50 Hz, the inductance of the coil is _____.



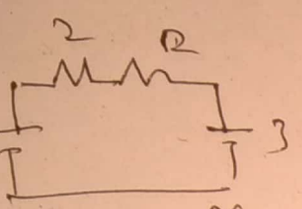
(1) 5.30 H (2) 31.8 mH (3) 1.32 H (4) 2.14 mH

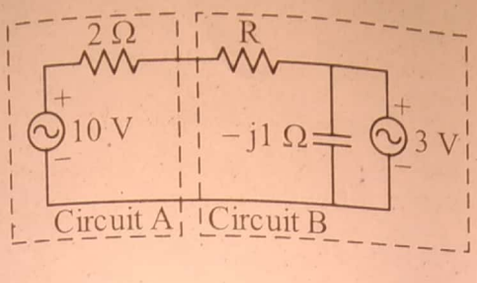
100. In a series RLC circuit, L = 15 mH, C = 0.015 μF and R = 80 Ω. The impedance of the circuit at the resonance frequency is _____.

(1) (0.015 F)ω Ω (2) 80 Ω

(3) $\frac{1}{(\omega \times (0.015))}\ \Omega$ (4) (15 mH)ω Ω

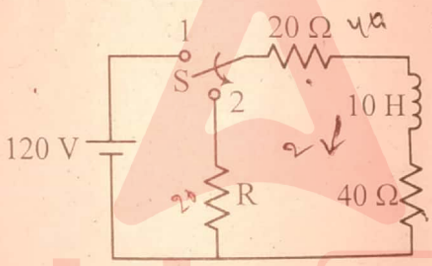
101. Assuming both the voltage sources are in phase, the value of R for which maximum power is transferred from circuit A to circuit B is _____





(1) 1.4 Ω (2) 2 Ω (3) 2.8 Ω (4) 0.8 Ω

102. A coil of inductance 10 H and resistance 40 Ω is connected as shown in the figure. After the switch S has been in contact with point 1 for a very long time, it is moved to point 2 at t = 0. If, at $t = 0^+$, the voltage across the coil is 120 V, the value of resistance R is _____.



(1) 20 Ω (2) 40 Ω (3) 60 Ω (4) 0 Ω

103. As $R_L \to \infty$, the magnitude of the gain of the CS amplifier approaches _____

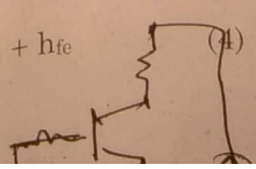
(1) 0 (2) μ (3) ∞ (4) Unity

104. A Ge transistor has $I_{CO} = 0.01$ mA at 25°C. If β_{dc} remains unchanged, the leakage current at 100°C is _____.

(1) 0.81 mA (2) 18.1 mA (3) 8.1 mA (4) 1.81 mA

105. The current gain of a CB amplifier is approximately _____.

(1) ∞ (2) 1 (3) $1 + h_{fe}$ (4) h_{fe}



106. The slew rate of IC 741 is 0.5V/μs. The maximum possible output voltage without distortion is 5V. Then the maximum frequency without distortion is _____.

(1) 1.592 kHz (2) 15.92 kHz (3) 100 kHz (4) 159.2 kHz

107. The condition that must be satisfied in a tuned collector oscillator for the oscillations to build up and sustain is _____.

(1) $h_{fe} = \frac{RC + h_{oe}L}{M}$ (2) $h_{fe} = \frac{M}{RC + h_{oe}L}$

(3) $\frac{h_{fe}}{h_{ie}} \leq \frac{RC + h_{oe}L}{M}$ (4) $\frac{h_{fe}}{h_{ie}} \geq \frac{RC + h_{oe}L}{M}$

108. The gate to source voltage V_{GS} applied to a FET is –3 V, I_{DSS} = 10 mA and V_P = –6 V. Then its drain current is _____.

(1) 5 mA (2) 4 mA (3) 6 mA (4) 2.5 mA

109. Full adder is constructed by using _____.

(1) two half adders and two OR gates
(2) one half adders and two OR gates
(3) one OR gate and one half adder
(4) two half adders and one OR gate

110. The minimum number of comparators used in an N-bit Successive approximation ADC is _____.

(1) N + 1 (2) 2N (3) 1 (4) N – 1

111. The function f(A,B,C) = $AB + \bar{A}.\bar{C}$ in SOP form using minterms is _____

(1) $f = m_0 + m_2 + m_4$ (2) $f = m_0 + m_1 + m_5 + m_6$

(3) $f = m_0 + m_2 + m_6 + m_7$ (4) $f = m_0 + m_1 + m_2 + m_3$

112. The per unit impedance of a circuit element is 0.15. If the base kV and base MVA are halved, then the new value of the per unit impedance of the circuit element will be

(1) 0.15 (2) 0.3 (3) 0.6 (4) 0.075

113. Which of the following circuit breaker has high reliability and minimum maintenance?

(1) Air blast circuit breaker
(2) Vacuum circuit breaker
(3) Circuit breaker with SF6 gas
(4) Oil circuit breaker

114. The inertia constants of two groups of machines, which swing together are M_1 and M_2. The inertia constant of the system is _____.

(1) $|M_1 - M_2|$
(2) $M_1 + M_2$
(3) $\frac{M_1 + M_2}{M_1 M_2}$
(4) $\frac{M_1 M_2}{M_1 + M_2}$

115. The inertia constant H of a machine of 200 MVA is 2 pu. Its value corresponding to 400 MVA will be _____.

(1) 2.0
(2) 1.0
(3) 0.5
(4) 4.0

116. In distance protection, the relay measures _____.

(1) positive sequence impedance of the line from relay up to the fault point
(2) self-impedance of the line from relay up to the fault point
(3) zero sequence impedance of the line from relay up to the fault point
(4) negative sequence impedance of the line from relay up to the fault point

117. For a 35 km transmission line having a lumped impedance of the line as 20 Ω, is required to be shown in the ABCD form, it is given as _____.

(1) $\begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$
(2) $\begin{bmatrix} 1 & 0 \\ 20 & 1 \end{bmatrix}$
(3) $\begin{bmatrix} 20 & 0 \\ 1 & 1 \end{bmatrix}$
(4) $\begin{bmatrix} 1 & 20 \\ 0 & 1 \end{bmatrix}$

118. A three phase 66 kV oil circuit breaker is rated 1200 A, 8000 MVA, 3 secs. The symmetrical breaking current is _____.

(1) 3.8 kA
(2) 1.2 kA
(3) 70 kA
(4) 35 kA

119. A coaxial cable has the following characteristics. L = 0.2 μH/m and C = 245 pF/m. The velocity of wave propagation through the cable is _____.

(1) 1.43 μm/s
(2) 0.143 m/s
(3) 143 m/s
(4) 14.3 m/s

120. For a load flow solution, the quantities normally specified at the voltage controlled bus are _____.

(1) P and |V| (2) Q and |V| (3) P and δ (4) P and Q

121. In a system of 132 kV, the line to ground capacitance is 0.01 μF and the inductance is 5 H. What is the value of resistance used across the contacts to eliminate the restriking voltage while interrupting a magnetizing current of 5 amps?

(1) 111.8 kΩ (2) 11.18 Ω (3) 111.8 Ω (4) 11.18 kΩ

122. The primary consideration in deciding the conductor size of EHV lines is _____.

(1) Current density
(2) Corona
(3) Power loss
(4) Voltage drop

123. In ACSR conductors, steel core is provided to _____.

(1) neutralise proximity effect (2) reduce line inductance
(3) increase the tensile strength (4) compensate for skin effect

124. Which of the following is not an advantage of transmitting power at high voltages?

(1) Better regulation (2) Lesser conductor material
(3) Reduced risk of corona (4) High efficiency

125. Which of the following generating stations has the minimum running cost?

(1) Nuclear power station (2) Thermal power station
(3) Diesel power plant (4) Hydro-electric station

126. Which of the following power plant has the maximum efficiency?

(1) Hydroelectric (2) Nuclear
(3) Diesel (4) Thermal

127. A N-bus transmission system with L number of lines has _____ number of nonzero elements in its Y-Bus.

(1) 2L (2) N + 2L (3) 2N + L (4) N + L

128. If 'x' is the number of layers and each layer has a diameter 'd' then the overall diameter of a stranded conductor is _____.

(1) (3x – 1)d (2) (6x – 3)d (3) (2x + 1)d (4) (2x – 1)d

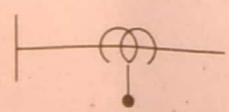
129. Which of the following circuit breakers does not use pneumatic operating mechanism?

(1) SF_6 blast circuit breaker (2) Air break circuit breaker
(3) Bulk-oil circuit breaker (4) Air blast circuit breaker

130. Most of the fuses operate due to the _____.

(1) magnetic effect of current. (2) electrostatic effect of current.
(3) cooling effect of current. (4) heating effect of current.

131. Match the following.

Symbol	Equipment
a) 	i) current transformer
b) 	ii) Lightening arrester
c) 	iii) Earthing switch
d) 	iv) Isolator

(1) (a-ii), (b-iii), (c-i), (d-iv) (2) (a-iii), (b-i), (c-iv), (d-ii)
(3) (a-iv), (b-iii), (c-ii), (d-i) (4) (a-i), (b-ii), (c-iii), (d-iv)

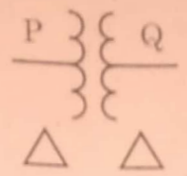
132. A system having connected load of 100 kW, peak load of 80 kW, base load of 20 kW and average load of 40 kW, will have a load factor of _____.

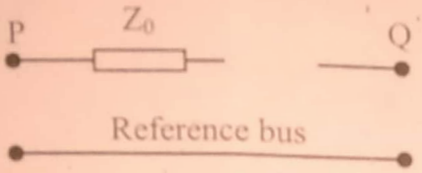
(1) 50% (2) 60% (3) 80% (4) 40%

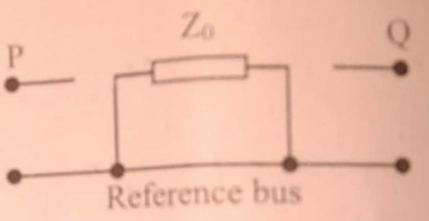
133. The minimum dielectric stress in a cable is at _____.

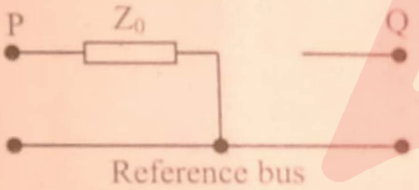
(1) bedding
(2) conductor surface
(3) lead sheath
(4) armour .

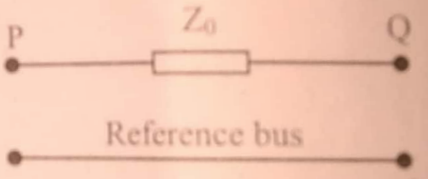
134. Which one of the following is the zero sequence equivalent circuit of the three phase transformer bank shown in the figure?



(1)


(2)


(3)


(4)


135. In order to have same inductance per phase, the transmission lines are _____.

(1) stranded (2) transposed (3) twisted (4) bundled

136. The best method to obtain the efficiency of two identical transformers under loading conditions is _____.

(1) short circuit test
(2) no load test
(3) back-to-back test
(4) open circuit test

137. In a slip ring induction motor, if the rotor resistance is increased, then _____.

(1) starting torque increases and efficiency decreases
(2) starting torque and efficiency decrease
(3) starting torque and efficiency increase
(4) starting torque decreases but efficiency decreases

138. Which of the following statements is correct with regard to field control of a DC motor?

(1) It acts as constant kW drive.

(2) It acts as constant speed drive.

(3) It acts as constant speed and torque drive.

(4) It acts as constant torque drive.

139. What is the short circuit ratio of a synchronous machine?

(1) $\frac{1}{X_s(\text{unsaturated}) \text{ p.u.}}$

(2) $\frac{1}{X_s(\text{adjusted}) \text{ p.u.}}$

(3) $\frac{1}{X_s(\text{adjusted}) \text{ in Ohms}}$

(4) $\frac{1}{X_s(\text{unsaturated}) \text{ in Ohms}}$

140. A synchronous generator having synchronous reactance of 1 p.u. is connected to an infinite bus through 0.2 p.u. reactance. The infinite bus has voltage of 1 p.u. For obtaining maximum output of 1.2 p.u., the synchronous generator emf is _____

(1) 1.44 p.u (2) 1.0 p.u (3) 0.8 p.u. (4) 1.2 p.u.

141. Which one of the following motors runs at the same speed from no-load to full load?

(1) DC shunt motor

(2) Cumulatively compounded DC motor

(3) Synchronous motor

(4) Induction motor

142. The maximum torque delivered by a synchronous motor is proportional to _____.

(1) V^2 (2) $\frac{1}{V}$ (3) $\frac{1}{V^2}$ (4) V

143. If a ceiling fan fails to start, what could be the possible reasons?

(I) Its supply voltage terminals are reversed

(II) Main winding is open circuited

(III) Auxiliary winding is open circuited

(IV) Main and auxiliary winding connections are interchanged

(V) Capacitor is short circuited

(1) (I), (III) and (IV) (2) (II), (IV) and (V)

(3) (II), (III) and (V) (4) (I), (II) and (IV)

144. A DC machine is provided with both interpole winding (IPW) and compensating winding (CPW) with respect to the armature

(1) Both IPW and CPW are in parallel
(2) IPW is in parallel and CPW is in series with the armature
(3) IPW is in series and CPW is in parallel with the armature
(4) Both IPW and CPW are in series

145. A DC series motor draws 20 A from 260 V supply when it runs at 600 RPM. The motor is supplying a constant torque load. The combined armature and field winding resistance of the motor is 1Ω. If the supply voltage is decreased to 200 V, the speed of the motor will be _____.

(1) 800 RPM (2) 432 RPM (3) 450 RPM (4) 600 RPM

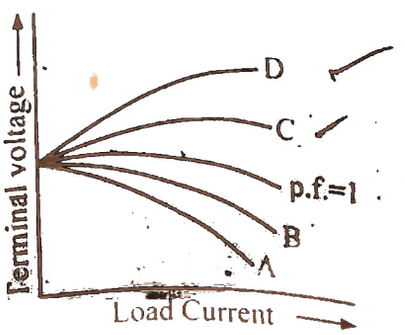
146. A 3-ϕ salient pole alternator is delivering about 15% of its rated power to an infinite bus. If its excitation fails, then it acts as _____.

(1) synchronous generator (2) reluctance generator
(3) induction generator (4) synchronous motor

147. A round rotor synchronous generator has a leakage reactance of 1%, armature reaction reactance of 9% at full load upf. Neglecting armature resistance, it's no load emf at full load upf with terminal voltage of 1.0 pu would be _____.

(1) 1.21 p.u. (2) 1.0 p.u. (3) 1.1 p.u. (4) 1.25 p.u.

148. The load characteristics of alternator at different power factors is shown below. The characteristic for leading power factor would be _____.



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

148. A 1-ϕ diode bridge rectifier supplies a highly inductive load. The load current can be assumed to be ripple free. The AC supply side current waveform will be

(1) constant DC (2) square (3) triangular (4) sinusoidal

150. The starting current of a 3-ϕ induction motor is 5 times the rated current, while the full load slip is 4%. The ratio of starting torque to full load torque is _____.

(1) 1.6 (2) 0.8 (3) 1.2 (4) 1.0

151. A synchronous motor is operating at constant load while its excitation is adjusted to give unity power factor current. If the excitation is now increased, the power factor will be

(1) remains unity (2) lagging (3) become zero (4) leading

152. A 2:1 ratio two winding transformer is connected as an auto transformer. Its kVA rating as an auto transformer compared to a two winding transformer is

(1) 1.5 times (2) 2 times (3) 3 times (4) the same

153. An unexcited single phase synchronous motor is _____

(1) a universal motor (2) a repulsion motor
(3) an AC series motor (4) a reluctance motor

154. The emf induced in a conductor with an active length of 0.5 m moving with a surface speed of rotation 70 m/sec in the air gap with 1.2 Wb/m² flux density is _____.

(1) 29.17 volts (2) 70 volts (3) 42 volts (4) 116.67 volts

155. A 200 V DC shunt motor running at 1000 rpm takes an armature current of 17.5 A. What is the additional resistance to be added in the armature circuit to reduce the speed of the motor to 600 rpm with armature current remaining at 17.5 A? (Armature resistance of the motor is 0.4 Ω)

(1) 4.8 Ω (2) 1.6 Ω (3) 4.0 Ω (4) 4.4 Ω

156. The effect of source inductance on the performance of single phase and three phase full converters is to _____.

(1) make the discontinuous current as continuous.

(2) reduce the output voltage.

(3) increase the load voltage.

(4) reduce ripple in the load current.

157. In voltage source inverters _____.

(1) Both V and I depend on Z.

(2) V does not depend on Z but I depends on Z.

(3) Both V and I do not depend on Z.

(4) Load voltage (V) depends on load impedance (Z), whereas load current (I) does not depend on Z.

158. A 1-ϕ voltage source inverter feeds pure inductive load with square wave source. What is the nature of load current?

(1) Trapezoidal (2) Square-wave (3) Triangular (4) Sinusoidal

159. A synchronous motor is connected with voltage source inverter then which of the following controls are possible?

(I) voltage control (II) V/f control

(III) current control (IV) frequency control

(1) (III) and (IV) (2) (I), (III) and (IV)

(3) (I), (II) and (IV) (4) (I) and (II)

$V_0 = \frac{6V_{dc}}{\pi}\cos(n\omega t)$

160. A 1-ϕ full-wave, diode-bridge rectifier is supplied from 200 V, 50 Hz source. The load is a 100 Ω resistor. The peak inverse voltage of each diode in the rectifier is _____.

(1) $200\sqrt{2}$ V (2) $\frac{400\sqrt{2}}{\pi}$ V (3) $\frac{400}{\pi}$ V (4) 200 V

PIV = V_m

$= 200\sqrt{2}$

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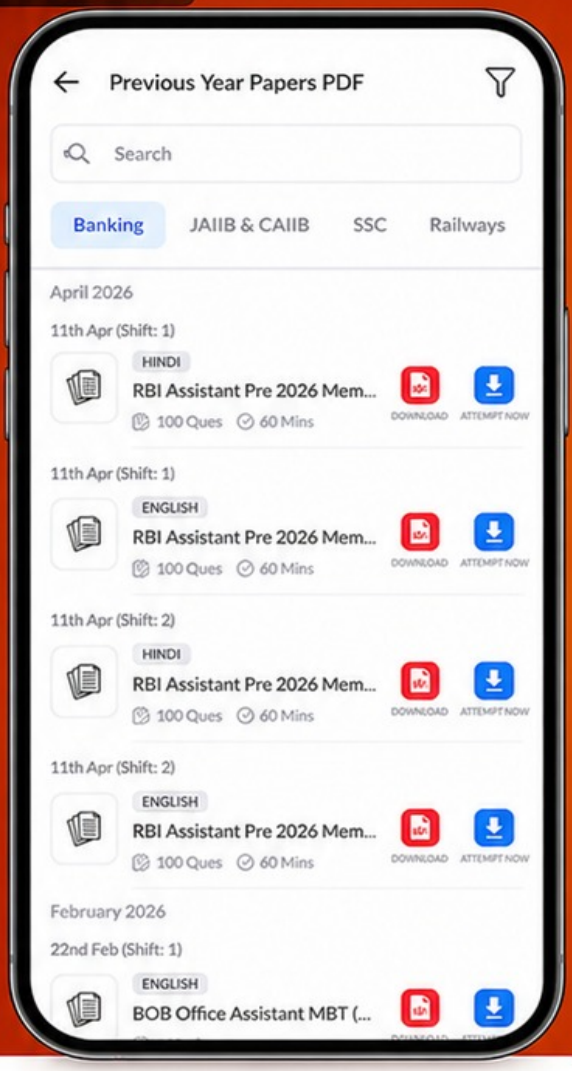

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