1-7-12
1/2011 to 31/2011

EEA/502 2012

Series **C**

1/2011 to 31/2011
Dec 1-7-12

ELECTRICAL ENGINEERING

Paper II

*Time : **150** Minutes* *Max. Marks : **150***

INSTRUCTIONS

1. Please check the Test Booklet and ensure that it contains all the questions. If you find any defect in the Test Booklet or Answer Sheet, please get it replaced immediately.

2. The Test Booklet contains **150** questions. Each question carries **one** mark.

3. The Test Booklet is printed in four (4) Series, viz. [A] [B] [C] [D]. The Series, [A] or [B] or [C] or [D] is printed on the right-hand corner of the cover page of the Test Booklet. Mark your Test Booklet Series [A] or [B] or [C] or [D] in Part C on side 1 of the Answer Sheet by darkening the appropriate circle with Blue/Black Ball point pen.

Example to fill up the Booklet Series

If your Test Booklet Series is **A**, please fill as shown below :

● (B) (C) (D)

If you have not marked the Test Booklet Series at Part C of side 1 of the Answer Sheet or marked in a way that it leads to discrepancy in determining the exact Test Booklet Series, then, in all such cases, your Answer Sheet will be invalidated without any further notice. No correspondence will be entertained in the matter.

4. Each question is followed by 4 answer choices. Of these, you have to select one correct answer and mark it on the Answer Sheet by darkening the appropriate circle for the question. If more than one circle is darkened, the answer will not be valued at all. Use Blue/Black Ball point pen to make heavy black marks to fill the circle completely. Make **no** other stray marks.

e.g. : If the answer for Question No. **1** is Answer choice (2), it should be marked as follows :

1 | (1) | ● | (3) | (4)

5. Mark Paper Code and Roll No. as given in the Hall Ticket with Blue/Black Ball point pen by darkening appropriate circles in Part A of side 1 of the Answer Sheet. Incorrect/not encoding will lead to ***invalidation*** of your Answer Sheet.

Example : If the Paper Code is **027**, and Roll No. is **95640376** fill as shown below :

Paper Code

0	2	7
●	⓪	⓪
①	①	①
②	●	②
③	③	③
④	④	④
⑤	⑤	⑤
⑥	⑥	⑥
⑦	⑦	●
⑧	⑧	⑧
⑨	⑨	⑨

Roll No.

9	5	6	4	0	3	7	6
⓪	⓪	⓪	⓪	●	⓪	⓪	⓪
①	①	①	①	①	①	①	①
②	②	②	②	②	②	②	②
③	③	③	③	③	●	③	③
④	④	④	●	④	④	④	④
⑤	●	⑤	⑤	⑤	⑤	⑤	⑤
⑥	⑥	●	⑥	⑥	⑥	⑥	●
⑦	⑦	⑦	⑦	⑦	⑦	●	⑦
⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧
●	⑨	⑨	⑨	⑨	⑨	⑨	⑨

6. Please get the signature of the Invigilator affixed in the space provided in the Answer Sheet. An Answer Sheet without the signature of the Invigilator is liable for ***invalidation***.

7. The candidate should **not** do rough work or write any irrelevant matter in the Answer Sheet. Doing so will lead to ***invalidation***.

8. Do **not** mark answer choices on the Test Booklet. Violation of this will be viewed seriously.

9. Before leaving the examination hall, the candidate should hand over the original OMR Answer Sheet (top sheet) to the Invigilator and carry the bottom sheet (duplicate) for his/her record, failing which disciplinary action will be taken.

10. Use of whitener is prohibited. If used, the answer sheet is liable for invalidation.

1. The essential condition for parallel operation of two dc generators is they have the same

(1) kW rating

(2) terminal voltage

(3) operating speed

(4) All of these

2. A dc motor delivering constant power output initially operates at 1500 rpm with torque delivered as 200 Nm. The torque delivered at 1200 rpm is

(1) 160 Nm

(2) 200 Nm

(3) 230 Nm

(4) 250 Nm

3. The T_d vs I_a characteristic of a dc series motor is a

(1) straight line throughout

(2) parabola throughout

(3) straight line from no-load to certain load and parabola thereafter

(4) parabola from no-load to certain load and straight line thereafter

4. The Laplace inverse of $s/(s + 2)$ is given by

(1) $u(t) + 2e^{-2t}\, u(t)$

(2) $\delta(t) + 2e^{-2t}\, u(t)$

(3) $\delta(t) - e^{-2t}\, u(t)$

(4) $u(t) - e^{-2t}\, u(t)$

5. If current flowing in a lamp drops by 1 percent, the power will be decreased by

(1) 2%

(2) 4%

(3) 0·1%

(4) 1%

6. The most suitable material for transformer core is

(1) hot rolled grain oriented steel

(2) cold rolled grain oriented steel

(3) aluminium

(4) copper

7. In cascade operation of two induction motors, the ratio of mechanical power developed and electrical power in the rotor of the main induction motor having P_1 number of stator poles will be

(1) P_1/P_2

(2) P_2/P_1

(3) $(P_1 + P_2)/P_2$

(4) $(P_1 - P_2)/P_2$

8. The thickness of stator laminations is of the order of

(1) 0·5 mm

(2) 1 mm

(3) 0·05 mm

(4) None of these

9. In large capacity transformers, 5% of the turns at the end of hv winding are provided with extra insulation so as to provide protection

(1) against corona

(2) against lightning

(3) due to surges occurring during switching operation

(4) All of these

10. The current flowing in an inductive circuit consisting of a resistance and an inductance is expressed by $i = I_m \sin \omega t$. The expression for the applied voltage will be

(1) $v = V_m \sin(\omega t + \phi)$

(2) $v = V_m \sin(\omega t - \theta)$

(3) $v = V_m \sin \omega t$

(4) $v = V_m \sin(\omega t - \pi/2)$

11. Varley loop tests are preferred over Murray loop tests because

(1) Varley loop test can locate open circuit fault

(2) Varley loop test gives higher accuracy

(3) in Varley loop test provision is made for the measurement of total loop resistance instead of obtaining it from the relation $R = \rho l/a$

(4) Varley loop test can locate the earth fault

12. For applications requiring speed ratio other than 2 : 1, the speed control of an induction motor can be effected by varying the number of stator poles employing

(1) multiple stator winding

(2) pole amplitude modulation technique

(3) consequent pole technique

(4) Any of these

13. In 3-phase induction motors, speeds higher than synchronous speed can be had by

(1) line voltage control

(2) rotor slip power control

(3) rotor resistance control

(4) frequency control

14. The method of speed control used for increasing the speed of a dc shunt motor above its rated speed is

(1) armature resistance control

(2) field control

(3) armature voltage control

(4) series parallel control

15. If N is the speed, then the windage loss in dc motor is proportional to

(1) $N^{0.5}$

(2) $N^{1.0}$

(3) $N^{1.5}$

(4) $N^{2.0}$

16. If R_{12}, X_{12} are the total resistance and reactance of the transformer referred to secondary, I_2 is the secondary load curren and $\cos \phi_2$ is the leading pf, then equation fo rise in voltage when load is thrown off is

(1) $I_2 R_{12} \cos \phi_2 - I_2 X_{12} \sin \phi_2$

(2) $I_2 R_{12} \cos \phi_2 + I_2 X_{12} \sin \phi_2$

(3) $I_2 R_{12} \sin \phi_2 - I_2 X_{12} \cos \phi_2$

(4) $I_2 R_{12} \sin \phi_2 + I_2 X_{12} \cos \phi_2$

17. [illegible]

(1) 50 kVA

(2) 57·74 kVA

(3) 66·67 kVA

(4) 100 kVA

18. In a Scott connected transformer, the number of turns in the main and teaser transformer respectively are

(1) T, $\sqrt{3}$ T/2

(2) T/2 + T/2, $\sqrt{3}$ T/2

(3) T/2 + T/2, 2T/$\sqrt{3}$

(4) T/2, $\sqrt{3}$ T/2

19. The purpose of interpoles in dc machines is to nullify

(1) the demagnetizing effect of armature mmf

(2) the cross-magnetizing effect of armature mmf

(3) the reactance voltage

(4) both the cross-magnetizing mmf and the reactance voltage

20. The starting torque of an induction motor varies as

(1) f

(2) $1/f^2$

(3) 1/f

(4) f^2

21. [illegible]

(3) reduce the voltage applied across the motor terminals

(4) increase the motor speed

22. In a CRO, the quantity to be measured is applied across

(1) focusing electrodes

(2) cathode

(3) Y-plates

(4) X-plates

23. The resistance of a wire is 2 Ω. If the diameter of the wire is reduced to half, keeping the same length, the resistance will be

(1) 1 Ω

(2) 4 Ω

(3) 0·5 Ω

(4) 8 Ω

24. In electric discharge lamps, light is produced by

(1) cathode ray emission

(2) ionization in a gas or vapours

(3) heating effect of current

(4) magnetic effect of current

25. Which of the following bulbs operates on least power ?

(1) GLS bulb

(2) Torch bulb

(3) Neon bulb

(4) Night bulb

26. The gas used in sodium vapour lamp is

(1) argon

(2) neon

(3) nitrogen

(4) oxygen

the

(1) voltage sources are short-circuited and all current sources are open-circuited

(2) voltage sources and current sources are left as they are

(3) sources are replaced by their internal resistances

(4) voltage sources are open-circuited and all current sources are short-circuited

28. A synchronous machine connected to a power system grid bus-bar is operating as a generator. To make the machine operate as a motor, the

(1) direction of rotation is to be reversed

(2) phase sequence is to be changed

(3) field excitation is to be decreased

(4) mechanical input is to be less than the losses at the shaft

29. The speed of a synchronous motor depends upon

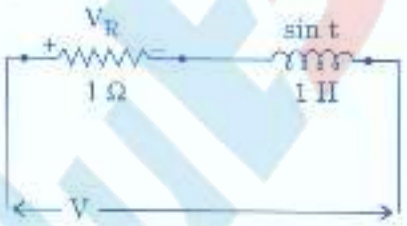
(1) supply voltage

(2) supply frequency

(3) number of poles

(4) both supply frequency and number of poles

30. In the circuit of series RL given in fig., V is given by



(1) 2 sin t

(2) 2 cos t

(3) sin (t + 45°)

(4) $\sqrt{2}$ sin (t + 45°)

basically a

(1) field control method

(2) field diverter method

(3) armature resistance control method

(4) voltage control method

32. Two dc series motors connected in series draw current I amps from supply and run at speed N. When the same motors are connected in parallel taking current 1 amps from the supply, the speed of each motor will be

(1) N

(2) 2 N

(3) 4 N

(4) $\frac{N}{2}$

33. The purpose of providing dummy coils in dc machine armature is to

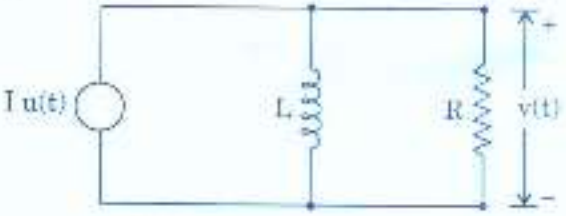
(1) reduce eddy currents

(2) increase voltage induced

(3) decrease armature resistance

(4) provide mechanical balance for the motor

34. In the circuit of fig. given, v(t) for t > 0 is given by



(1) IR $e^{-L/R}$

(2) IR $e^{-R/L}$

(3) IR $(1 - e^{R/L})$

(4) IR $(1 - e^{-L/R})$

its speed is also doubled, the torque developed in the machine will

(1) get doubled

(2) become 4 times

(3) get halved

(4) remain unaltered

36. The most efficient electrical machine is the

(1) dc machine

(2) induction motor

(3) synchronous machine

(4) transformer

37. Oil in a transformer is used for

(1) insulation

(2) insulation and cooling

(3) lubrication

(4) insulation, cooling and lubrication

38. What percent of the input energy is radiated by filament lamps ?

(1) 2 to 5 percent

(2) 10 to 15 percent

(3) 25 to 30 percent

(4) 40 to 50 percent

39. The no-load current of a single phase induction motor is around _____% of full load current.

(1) 10

(2) 20

(3) 40

(4) 80

alternator is

(1) magnetizing only

(2) demagnetizing only

(3) cross-magnetizing only

(4) None of these

41. Carbon arc lamps are commonly used in

(1) photography

(2) cinema projectors

(3) domestic lighting

(4) street lighting

42. Shaded pole induction motor does ***not*** have the advantage of

(1) high starting torque

(2) rugged construction

(3) low initial as well as maintenance cost

(4) comparatively small starting current

43. Which of the following need lowest level of illumination ?

(1) Auditoriums

(2) Railway platforms

(3) Displays

(4) Fine engravings

44. The distance between two coil sides which are connected to the same commutator segment is called as

(1) winding pitch

(2) back pitch

(3) front pitch

(4) full pitch

35. If the back emf of a dc motor is doubled and its speed is also doubled, the torque developed in the machine will

(1) get doubled
(2) become 4 times
(3) get halved
(4) remain unaltered

36. The most efficient electrical machine is the

(1) dc machine
(2) induction motor
(3) synchronous machine
(4) transformer

37. Oil in a transformer is used for

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(2) insulation and cooling
(3) lubrication
(4) insulation, cooling and lubrication

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(1) 2 to 5 percent
(2) 10 to 15 percent
(3) 25 to 30 percent
(4) 40 to 50 percent

39. The no-load current of a single phase induction motor is around _____% of full load current.

(1) 10
(2) 20
(3) 40
(4) 80

40. For zero leading power factor, the effect of armature reaction on the main flux in an alternator is

(1) magnetizing only
(2) demagnetizing only
(3) cross-magnetizing only
(4) None of these

41. Carbon arc lamps are commonly used in

(1) photography
(2) cinema projectors
(3) domestic lighting
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(1) winding pitch
(2) back pitch
(3) front pitch
(4) full pitch

54. In capacitor start single-phase induction motor, the current in the

(1) starting winding lags the voltage

(2) main winding leads the voltage

(3) starting winding leads the voltage

(4) supply lines leads the voltage

55. A 3-phase induction motor is operating at slip s. If the two supply leads are interchanged, then its slip at that instant will be

(1) $2 - s$

(2) $2 + s$

(3) $1 + s$

(4) $1 - s$

56. For precision work, the illumination level required is of the order of

(1) 500 – 1000 lumens/m^2

(2) 200 – 2000 lumens/m^2

(3) 50 – 100 lumens/m^2

(4) 10 – 25 lumens/m^2

57. The deflecting torque of a moving iron instrument is

(1) $I^2 dL/d\theta$

(2) $\frac{1}{2} I^2 dL/d\theta$

(3) $I\, dL/d\theta$

(4) $\frac{1}{2} I\, dL/d\theta$

58. The range of an electrostatic voltmeter can be extended by using

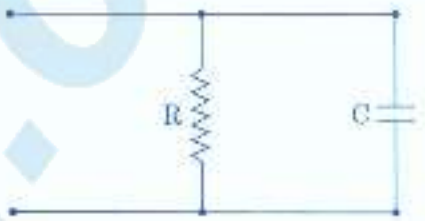
(1) an inductor in series

(2) a resistor in series

(3) a capacitor of capacitance smaller than that of voltmeter, in series

(4) a capacitor of capacitance larger than that of voltmeter, in series

59. The RC circuit shown in fig. is fed from an ac source of frequency ω rad/s. The power factor of the circuit is



(1) $\omega C/R$

(2) $\sqrt{1 - R^2C^2\omega^2}$

(3) $1/\sqrt{1 + R^2C^2\omega^2}$

(4) $RC\omega/\sqrt{1 + R^2C^2\omega^2}$

60. In a shaded pole motor the phase splitting is achieved by placing a shading coil at the slot cut around the

(1) larger part of the pole

(2) smaller part of the pole

(3) both the parts of the pole

(4) Any of these

61. For instruments with very weak magnetic field, we use

(1) Eddy current damping

(2) Air friction damping

(3) Oil friction damping

(4) None of these

62. Speed of a dc shunt motor beyond the rated speed can be increased by

(1) increasing the resistance in the field circuit

(2) increasing the resistance in the armature circuit

(3) decreasing the resistance in the field circuit

(4) decreasing the resistance in the armature circuit

63. While performing the open-circuit and short-circuit tests on a transformer to determine parameters, the status of low voltage (LV) and high voltage (HV) winding will be such that

(1) in OC, LV is open and in SC, HV is shorted

(2) in OC, HV is open and in SC, LV is shorted

(3) in OC, LV is open and in SC, LV is shorted

(4) in OC, HV is open and in SC, HV is shorted

64. Two holes are drilled in the disc of energy meter on the opposite sides of the spindle

(1) to increase the deflection torque

(2) to eliminate the creeping on no load

(3) for proper ventilation

(4) to reduce the weight of the disc for easy rotation

65. The purpose of providing compensating winding in a dc motor is to

(1) obtain satisfactory commutation during normal operation

(2) reduce speed regulation

(3) prevent commutator flash-over upon sudden change in load

(4) reduce leakage in magnetic field

66. The fall in terminal voltage of a loaded dc shunt generator is mainly due to

(1) armature resistance drop

(2) demagnetizing effect of armature resistance

(3) brush contact drop

(4) weakening effect of the field current

67. The voltage regulation of an over compounded dc generator on full-load is

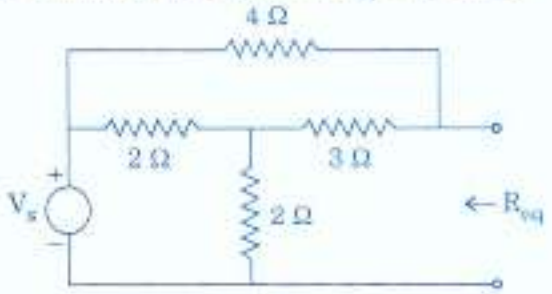
(1) zero

(2) low positive

(3) high positive

(4) negative

68. In the circuit of fig. below, R_{eq} is given by



(1) 5 Ω

(2) 2 Ω

(3) 4 Ω

(4) 6 Ω

69. In a dc shunt motor, if the terminal voltage is reduced to half, torque remaining the same, the

(1) speed will become half and the armature current will also become half

(2) speed will become half and the armature current remains the same

(3) speed will become half while armature current doubles

(4) speed as well as armature current will double

70. In an alternator, the distribution factor k_d is given by

(1) $k_d = \dfrac{\sin\left(\frac{n\alpha}{2}\right)}{n \sin\left(\frac{\alpha}{2}\right)}$

(2) $k_d = \dfrac{n \sin\left(\frac{\alpha}{2}\right)}{\sin\left(\frac{n\alpha}{2}\right)}$

(3) $k_d = \dfrac{\sin\left(\frac{n\alpha}{2}\right)}{\sin\left(\frac{\alpha}{2}\right)}$

(4) $k_d = \dfrac{\sin\left(\frac{\alpha}{2}\right)}{\sin\left(\frac{n\alpha}{2}\right)}$

where 'n' is the number of slots per pole and 'α' is the angle in electrical degrees between the slots.

71. The operation of a 3-phase synchronous motor operating on constant excitation across infinite bus will not be stable if power angle δ

(1) exceeds internal angle θ

(2) is less than θ

(3) exceeds $\theta/2$

(4) is less than $\theta/2$

72. The dc motor used for intermittent high torque loads is

(1) dc series motor

(2) dc shunt motor

(3) differential compound motor

(4) cumulative compound motor

73. A cumulative dc compound motor runs at 1500 r.p.m. on full load. If its series field is short-circuited, its speed

(1) becomes zero

(2) remains unchanged

(3) increases

(4) decreases

74. The following instrument is ***not*** a current operated instrument :

(1) electrodynamometer instrument

(2) electrostatic instrument

(3) hot wire instrument

(4) moving coil instrument

75. A synchronous motor is delivering 80% of its rated output and is operating at UPF. If its excitation is increased, then

(1) the output delivered gets increased

(2) its pf becomes lagging

(3) the output delivered gets decreased

(4) its pf becomes leading

69. In a dc shunt motor, if the terminal voltage is reduced to half, torque remaining the same, the

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(2) $k_d = \dfrac{n\sin\left(\frac{\alpha}{2}\right)}{\sin\left(\frac{n\alpha}{2}\right)}$

(3) $k_d = \dfrac{\sin\left(\frac{n\alpha}{2}\right)}{\sin\left(\frac{\alpha}{2}\right)}$

(4) $k_d = \dfrac{\sin\left(\frac{\alpha}{2}\right)}{\sin\left(\frac{n\alpha}{2}\right)}$

where 'n' is the number of slots per pole and 'α' is the angle in electrical degrees between the slots.

71. The operation of a 3-phase synchronous motor operating on constant excitation across infinite bus will not be stable if power angle δ

(1) exceeds internal angle θ

(2) is less than θ

(3) exceeds θ/2

(4) is less than θ/2

72. The dc motor used for intermittent high torque loads is

(1) dc series motor

(2) dc shunt motor

(3) differential compound motor

(4) cumulative compound motor

73. A cumulative dc compound motor runs at 1500 r.p.m. on full load. If its series field is short circuited, its speed

(1) becomes zero

(2) remains unchanged

(3) increases

(4) decreases

74. The following instrument is ***not*** a current operated instrument :

(1) electrodynamometer instrument

(2) electrostatic instrument

(3) hot wire instrument

(4) moving coil instrument

75. A synchronous motor is delivering 80% of its rated output and is operating at UPF. If its excitation is increased, then

(1) the output delivered gets increased

(2) its pf becomes lagging

(3) the output delivered gets decreased

(4) its pf becomes leading

76. A synchronous motor can be used as synchronous condenser when it is

(1) under loaded

(2) over loaded

(3) under excited

(4) over excited

77. If Z_d, X_d and X_q are per-phase values of direct axis synchronous impedance, direct axis synchronous reactance and quadrature axis synchronous reactance respectively, then for a non salient-pole synchronous machine

(1) $X_d > X_q$

(2) $X_d < X_q$

(3) $X_d = X_q$

(4) $X_d = Z_d$

78. In the given circuit, the current is $i(t) = 4 \sin(500\ t)$ A. The applied voltage in volts is

(1) 40 sin (500 t)

(2) 56·56 sin (500 t + 45°)

(3) 40 cos (500 t)

(4) 56·56 cos (500 t + 45°)

79. Operating torques in an indicating instrument are

(1) deflecting

(2) controlling

(3) damping

(4) All of these

80. In a transformer, the exciting current will be in phase quadrature with the impressed voltage provided

(1) only the leakage impedance drop is ignored

(2) only the core loss is ignored

(3) both leakage impedance drop and the core loss are ignored

(4) only the no-load copper loss is ignored

81. In a 3-phase synchronous motor, the magnitude of field flux

(1) remains constant at all loads

(2) varies with load

(3) varies with speed

(4) varies with power factor

82. A 3-phase synchronous motor needs dc supply for excitation

(1) continuously

(2) at the starting instant only

(3) of stator

(4) None of these

83. A synchronous motor operating with normal excitation adjusts to increased load due to increase in

(1) back emf

(2) armature current

(3) power factor

(4) None of these

84. A 5 kVA transformer has a turn-ratio of $(N_1/N_2) = 10$. The impedance of the primary winding is 3 + j5 ohms while that of secondary winding is 0·5 + j0·8 ohms. The impedance of the transformer when referred to the primary will be

(1) 3·5 + j 5·8 ohms

(2) 8·0 + j 13 ohms

(3) 53·0 + j 85 ohms

(4) 3·05 + j 5·08 ohms

85. In indicating instruments, the springs are mainly used to

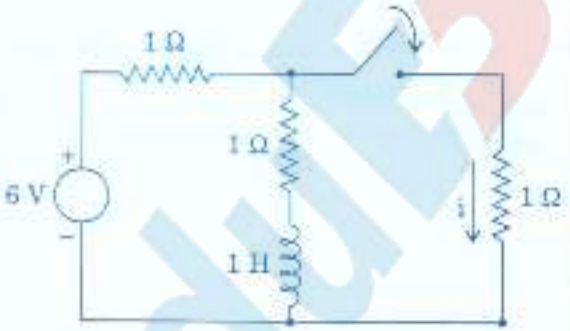
(1) hold the pivot in position

(2) conduct the current to the coils

(3) control the movement of the pointer

(4) reduce the vibrations of the pointer

86. In the circuit of fig. shown, steady state has been reached with the switch open. The switch is closed at t = 0. The current i at $t = 0^+$ is



(1) 3/2 A

(2) 9/2 A

(3) 2 A

(4) 4 A

87. The function of a starter in a dc motor is

(1) to control its speed

(2) to reduce the starting current to safe values

(3) to avoid sparking

(4) to minimize the armature reaction effect

88. During normal running conditions, the armature current drawn by a dc shunt motor is given by

(1) V/R_a

(2) $(V - E_b)/R_a$

(3) $(V + E_b)/R_a$

(4) $(E_b - V)/R_a$

89. In a dc machine, the laminated parts are armature and

(1) core

(2) yoke

(3) pole

(4) pole shoe

90. The direction of shaded pole single phase induction motor can be reversed by

(1) reversing the supply terminals

(2) shifting any shading coil to the other half of the pole

(3) shifting two shading coils to the other half of the pole

(4) shifting all the shading coils to the other half of the pole

91. Inverted V-curve of a synchronous motor is

(1) E vs I_f

(2) V vs I_f

(3) I_t vs I_f

(4) pf vs I_f

92. A 220 V dc machine has an armature resistance of 1 Ω. If the full-load current is 20 A, the difference in the induced voltage when the machine runs as a motor, and as a generator, is

(1) 20 V

(2) nil

(3) 40 V

(4) 50 V

93. A Lissajous pattern on an oscilloscope has 5 horizontal tangencies and 2 vertical tangencies. The frequency of the horizontal input is 1000 Hz. What is the frequency of the vertical input ?

(1) 400 Hz

(2) 2,500 Hz

(3) 4,000 Hz

(4) 5,000 HZ

94. The speed of single phase induction motors can be controlled by

(1) varying the applied voltage to the stator winding

(2) varying the number of poles on the stator

(3) either (1) or (2)

(4) None of these

95. Maximum operating frequency of CRO is mainly governed by its

(1) vertical amplifier

(2) horizontal amplifier

(3) cathode ray tube

(4) time base circuit

96. If V_{th} = 10 V, R_{th} = 2 Ω and R_L = 3 Ω, then current through R_L is

(1) 5 A

(2) 3·33 A

(3) 2 A

(4) 10 A

97. In dc machines, the space distribution of air gap flux density wave at no-load is

(1) sinusoidal

(2) co-sinusoidal

(3) flat-topped

(4) rectangular

98. The flux created by current flowing through the primary winding of a transformer induces emf in

(1) primary winding only

(2) secondary winding only

(3) transformer core only

(4) both primary and secondary windings

99. In the given circuit, the current flowing in the 2 Ω resistor is

(1) 1 A

(2) 1·5 A

(3) 0·8 A

(4) 2 A

100. The steady state value of the current in the given circuit is

(1) 4 A
(2) 2 A
(3) 1 A
(4) None of these

101. The ratings of a basic meter are 100 mV, 1 mA. The voltage range of this meter is to be extended to 1 volt. The value of the series resistance required to be connected with the meter is
(1) 400 Ω
(2) 900 Ω
(3) 100 Ω
(4) 1000 Ω

102. A transformer has hysteresis loss of 30 W, at 240 V, 60 Hz. The hysteresis loss at 200 V, 50 Hz, will be
(1) 25 W
(2) 25 W
(3) 30 W
(4) 36 W

103. In a synchronous machine, if the field flux axis is ahead of the armature field axis in the direction of rotation, the machine operating is
(1) synchronous motor
(2) synchronous generator
(3) asynchronous motor
(4) asynchronous generator

104. Synchronous generators are usually driven by
(1) steam turbines
(2) water turbines
(3) diesel engines
(4) either steam turbines or water turbines

105. Synchronous motors generally have
(1) salient pole rotor
(2) smooth cylindrical rotor
(3) either salient pole rotor or smooth cylindrical rotor
(4) None of these

106. A capacitor of $1/2\pi$ F is connected in series with a 1 Ω resistance to a voltage source 1 V, 2π Hz. The voltage drop across the capacitance would be
(1) 2 V, leading applied voltage by 90°
(2) $1/\sqrt{2}$ V, lagging applied voltage by 45°
(3) $1/\sqrt{2}$ V, leading applied voltage by 45°
(4) $\sqrt{2}$ V, lagging applied voltage by 90°

107. The differential equation governing a certain circuit is $RC(dv/dt) - v = \sqrt{2}\ E \cos \omega t$. The corresponding phasor equation is
(1) $(-j\omega RC - 1)\ \overline{V} = E \angle 90°$
(2) $(j\omega - RC)\ \overline{V} = E \angle 0°$
(3) $(j\omega CR + 1)\ \overline{V} = E \angle 0°$
(4) $(jRC\omega + 1)\ \overline{V} = E \angle 90°$

108. A series generator can self excite
(1) only if the load current is zero
(2) only if the load current is not zero
(3) irrespective of the value of load current
(4) None of these

109. Commutator and brush arrangement in a dc motor is provided to
(1) produce unidirectional torque
(2) reduce losses
(3) produce unidirectional current in the armature
(4) assist in changing in direction of rotation of the armature

110. In the two wattmeter method of measuring power in a balanced three-phase circuit, the readings of two wattmeters are in the ratio of 1 : 2. The circuit power factor is

(1) $1/\sqrt{2}$

(2) 1/2

(3) $\sqrt{3}/2$

(4) 1

111. Three impedances of Z Ω each are connected in delta. Their equivalent star impedance/phase will be

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

(2) $\sqrt{3}\,Z$

(3) Z/3

(4) 3Z

112. The function of a shunt in an ammeter is to

(1) increase the instrument resistance

(2) bypass the current

(3) reduce the voltage drop across the instrument coil

(4) increase the current flowing through the instrument coil

113. Loop tests in a cable cannot locate the

(1) open-circuit faults

(2) short-circuit faults

(3) earth fault

(4) None of these

114. The controlling torque in gravity controlled meter is proportional to

(1) cos θ

(2) sin θ

(3) tan θ

(4) θ

115. Variation in dc excitation of a synchronous motor causes variation in

(1) speed of motor

(2) power factor

(3) armature current

(4) both armature current and power factor

116. In a synchronous motor, squirrel cage winding is provided for making motor

(1) noise free

(2) self starting

(3) cheap

(4) quick start

117. A shaded pole single-phase induction motor can be used for

(1) wet-grinders

(2) food-mixies

(3) tape recorders

(4) personal computers as cooling fan

118. When a synchronous motor is started, the field winding is

(1) short-circuited

(2) open-circuited

(3) excited from a dc source

(4) excited from a 3-phase ac source

119. A meter has a full scale deflection of 90° at a current of 1 A. The response of the meter is square-law. Assuming spring control, the current for a deflection of 45° will be

(1) 0·25 A

(2) 0·5 A

(3) 0·67 A

(4) 0·707 A

120. A linear system with system function $H(s) = 1/s$ is excited with unit step input. The output for $t > 0$ is given by

(1) $\delta(t)$

(2) 1

(3) t

(4) t^2

121. A voltage of sin ωt, 50 Hz is applied to a capacitor of 1 F. The current in ampere at t = 1/200 s is

(1) 100

(2) $100\pi / \sqrt{2}$

(3) $100 / \sqrt{2}$

(4) 0

122. Kirchhoff's current and voltage laws apply for

(1) resistive circuits only

(2) linear circuits only

(3) nonlinear circuits only

(4) both linear and nonlinear circuits

123. The starting torque developed in a split-phase 1-phase induction motor is directly related to the phase angle, α, between the two winding currents by the relation

(1) cos α

(2) sin α

(3) sin 2α

(4) tan α

124. In a critically damped RLC series circuit, the time constant of the response on sudden constant excitation is

(1) 1/LC

(2) L/2R

(3) 1/2RC

(4) 2RC

125. The illumination at various points on a horizontal surface illuminated by the same source varies as

(1) $\cos^3 \theta$

(2) $\cos \theta$

(3) $1/r^2$

(4) $\cos^2 \theta$

126. The outer cage winding in a double cage induction motor has

(1) low resistance and low inductance

(2) low resistance and high inductance

(3) high resistance and low inductance

(4) high resistance and high inductance

127. A 3-phase slip-ring induction motor can run at its synchronous speed when

(1) its load is completely removed

(2) its supply voltage is increased

(3) external resistance is added in the rotor circuit

(4) emf is injected in the rotor circuit

128. A perfect diffuser surface is one that

(1) diffuses all the incident light

(2) absorbs all the incident light

(3) transmits the incident light

(4) scatters light uniformly in all directions

129. Sensitivity of an instrument is independent of

(1) amplitude distortion

(2) frequency response

(3) hysteresis or dead band

(4) All of these

130. A shaded pole single-phase induction motor always runs in

(1) clockwise direction

(2) anticlockwise direction

(3) the direction from the shaded to unshaded part of the poles

(4) the direction from the unshaded to shaded part of the poles

131. Which of the following is absolute instrument ?

(1) Power factor meter

(2) Ammeter

(3) Wattmeter

(4) Tangent galvanometer

132. In conversion of 3-phase to 2-phase supply with T-connection, the transformation ratio of the teaser will be _____ times of that of main transformer.

(1) $\sqrt{3}$

(2) 1·15

(3) 0·866

(4) unity

133. The emf induced in an alternator has fundamental component of 1000 V and third harmonic component of 90 V. The value of net emf is

(1) 1004·04 V

(2) 1000 V

(3) 1030 V

(4) 1090 V

134. For high starting torque, the most suitable type of 3-phase induction motor is

(1) slip ring

(2) squirrel cage

(3) double cage

(4) deep bar squirrel cage

135. When the supply voltage to an induction motor is reduced by 10%, the maximum torque will decrease by approximately

(1) 5%

(2) 10%

(3) 20%

(4) 40%

136. The voltage regulation of alternator delivering equal amount of active and leading reactive power to the load is

(1) zero

(2) low positive

(3) high positive

(4) negative

137. In a 3-phase, star connected alternator, a field current of 5 A gave open-circuit voltage of 415 V and short-circuit current of 10 A. The value of synchronous impedance is

(1) 23·96 Ω

(2) 41·5 Ω

(3) 47·92 Ω

(4) 71·88 Ω

138. The magnetizing current in a transformer is rich in

(1) 3^{rd} harmonic

(2) 5^{th} harmonic

(3) 7^{th} harmonic

(4) 13^{th} harmonic

139. Tappings of a transformer are provided

(1) at the phase end of lv side

(2) at the phase end of hv side

(3) at the neutral end of hv side

(4) at the middle of hv side

140. Which of the following methods is employed for starting a 3-phase synchronous motor ?

(1) Star-delta starter

(2) Damper winding

(3) Resistance starter in the stator circuit

(4) Damper winding in conjunction with a star-delta starter or an auto-transformer starter

141. The efficiency of a properly designed synchronous machine is of the order of

(1) 60%

(2) 80%

(3) 92%

(4) 99%

142. A synchronous motor may fail to pull into synchronism owing to

(1) excessive load

(2) low excitation

(3) high friction

(4) Any of these

143. In an induction motor, skewing of rotor bars reduces

(1) eddy currents and copper requirement

(2) noise, vibrations and synchronous cusps

(3) Both (1) and (2)

(4) None of these

144. In a squirrel cage induction motor, high starting torque is achieved by using

(1) high resistance in series with the rotor circuit

(2) low resistance across the rotor circuit

(3) double cage rotor

(4) None of these

145. The type of rotor preferred for alternators driven by steam turbine is

(1) cylindrical rotor

(2) slip-ring rotor

(3) salient pole rotor

(4) squirrel-cage rotor

146. The simplest method of shifting load from one shunt generator to the other running in parallel consists in

(1) using equalizer connection

(2) adjusting their field rheostats

(3) adding resistance in their armature circuits

(4) None of these

147. The instruments according to applications may be classified as

(1) switch board and portable instruments

(2) primary and secondary instruments

(3) moving iron and moving coil instruments

(4) indicating and recording instruments

148. If a shunt generator delivers 100 A at 200 V, and the resistance of the shunt field and armature are 100 Ω and 0·01 Ω respectively, the generated emf will be

(1) 212 V

(2) 205 V

(3) 210 V

(4) 201·02 V

149. The straight line characteristic drawn tangent to the initial portions of OCC and passing through origin is called

(1) short-circuit characteristic

(2) zero power factor characteristic

(3) open circuit characteristic of saturated machine

(4) open circuit characteristic of unsaturated machine

150. At full-load condition in a synchronous motor, the phasor relation between (per phase) terminal voltage V and induced emf E is

(1) E leads V by around 50°

(2) E leads V by around 25°

(3) E lags V by around 50°

(4) E lags V by around 25°

SPACE FOR ROUGH WORK