FOI/512

2009

ELECTRICAL ENGINEERING

Time : 150 Minutes *Max. Marks : 300*

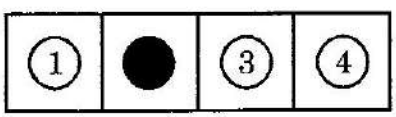
INSTRUCTIONS

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 **two** marks.

3. 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 HB pencil 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 :



4. Mark Paper Code and Roll No. as given in the Hall Ticket with HB pencil by darkening appropriate circles in Part A of side 2 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

5. 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***.

6. To change an answer, erase completely the already darkened circle and use HB pencil to make fresh mark.

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

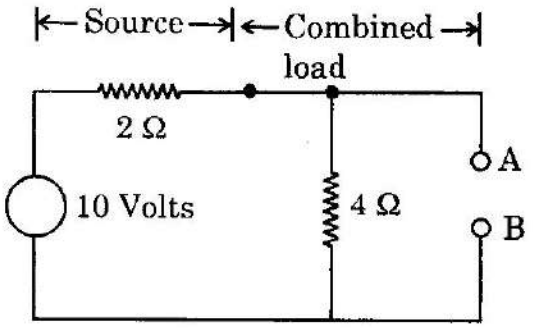
8. Do **not** mark answer choices on the Test Booklet. Violation of this will be viewed seriously.

9. Before leaving the examination hall, return the Answer Sheet to the Invigilator failing which, disciplinary action will be taken.

1. Node is defined as :
   (1) a point at which two or more circuit elements are joined
   (2) an equipotential point at which two or more circuit elements are joined
   (3) an equal impedance point at which two or more circuit elements are joined
   (4) an equal current point at which two or more circuit elements are joined

2. If the number of parallel paths in the network is more,.....method is preferred.
   (1) Nodal
   (2) Mesh
   (3) Ohm's Law
   (4) Superposition

3. The resistance which should be connected between A and B terminals



for maximum transfer of power from source to the combined load is :
   (1) 2 Ω
   (2) 4 Ω
   (3) infinity
   (4) zero

4. In an R-L series circuit, the resistance is varied by keeping X_L as constant. The maximum power transferred to be :
   (1) V^2/R
   (2) $2V^2/X_L$
   (3) $4V^2/Z$
   (4) $V^2/2X_L$

5. Which of the following is called as acceptor circuit ?
   (1) R-L Parallel
   (2) RLC Series
   (3) RLC Series Resonant
   (4) RLC Parallel Resonant

6. A parallel RLC resonant circuit may also be called as :
   (1) Rejecter Circuit
   (2) Anti-Resonant Circuit
   (3) Tuned Circuit
   (4) All of the above

7. Three identical resistances are connected in a star fashion against a balance three phase voltage supply. If one of the resistances be removed, by how much the power be reduced ?
   (1) 11.11%
   (2) 22.22%
   (3) 33.33%
   (4) 44.44%

8. A number of parallel voltage sources can be reduced to one equivalent one by :
   (1) Compensation theorem
   (2) Nodal analysis
   (3) Millman's theorem
   (4) Superposition theorem

9. Tellegen's theorem should be used for the circuits and circuit elements may be :
   (*i*) Linear/Non-linear
   (*ii*) Passive/Active
   (*iii*) Time invariant/Time varying
   (*iv*) May contain Dependent/ Independent Sources
   (1) (*i*), (*ii*) and (*iii*)
   (2) (*i*), (*ii*), (*iii*) and (*iv*)
   (3) (*i*) and (*iv*)
   (4) (*ii*) and (*iii*)

10. The determinant of the incidence matrix of a closed loop is :
   (1) unity
   (2) infinite
   (3) indefinite
   (4) zero

11. Active filters eliminate :
   (1) Resistors
   (2) Inductors
   (3) Capacitors
   (4) All of the above

12. The gradient of a scalar is a :
   (1) vector
   (2) scalar
   (3) zero
   (4) unity

13. Divergence theorem of electrostatic field is known as :
   (1) Poisson's theorem
   (2) Faraday's theorem
   (3) Gauss's theorem
   (4) Superposition theorem

14. Pointing vector is in the nature of :
   (1) Power density
   (2) Current density
   (3) Potential density
   (4) Charge density

15. A phase sequence indicator rotates clockwise for phase of RYB. If the phase sequence is changed to BRY, then it will rotate :
   (1) Anticlockwise
   (2) Clockwise
   (3) Slowly
   (4) At higher speed

16. From the safety point of view, the resistance of earthing electrode should be :
   (1) Low
   (2) High
   (3) Medium
   (4) The value of resistance of earth electrodes does not affect the safety

17. When localizing ground fault with the help of loop tests, the resistance of the fault affects :
   (1) The balance conditions
   (2) The value of cable resistance
   (3) The sensitivity of the bridge
   (4) All of the above

18. Maxwell's inductance-capacitance bridge is used for measurement of inductance of :
(1) Low Q coils
(2) Medium Q coils
(3) High Q coils
(4) High and medium Q coils

19. Frequency can be measured by using :
(1) Maxwell's bridge
(2) Schering bridge
(3) Heviside Campbell bridge
(4) Wien's bridge

20. Wagner's Earth devices are used in a.c. bridge circuit for :
(1) Eliminating the effect of earth capacitances
(2) Eliminating the effect of inter-component capacitances
(3) Eliminating the effect stray electrostatic fields
(4) Shielding the bridge elements

21. An ideal amplifier has :
(1) Noise figure of less than 1 dB
(2) Noise factor of unity
(3) Output S/N more than input S/N
(4) Noise figure of more than 0 dB

22. Multistage amplifiers are used in order to achieve greater :
(1) Voltage Amplification
(2) Power gain
(3) Frequency response
(4) All of the above

23. When power output of an amplifier doubles, the increase in its power level is.....decibels.
(1) 2
(2) 20
(3) 3
(4) 10

24. Negative feedback is an amplifier :
(1) Lowers its lower 3dB frequency
(2) Raises its upper 3dB frequency
(3) Increases its bandwidth
(4) All of the above

25. A relaxation oscillator is one which :
(1) has two stable states
(2) relaxes indefinitely
(3) produces non-sinusoidal output
(4) oscillates continuously

26. In a transistor Hartley oscillator :
(1) Inductive feedback is used
(2) Untapped coil is used
(3) Entire coil in the output circuit is used
(4) No capacitor is used

27. Which semiconductor device acts like a diode and two resistors :
(1) SCR
(2) Triac
(3) Diac
(4) UJT

28. An SCS has :
(1) four layers and three terminals
(2) three layers and four terminals
(3) two anodes and two gates
(4) one anode, one cathode and two gates

29. For small values of drain-to-source voltage, JFET behaves like a :
(1) resistor
(2) constant current source
(3) constant voltage source
(4) negative resistance

30. FETs have similar properties to :
(1) PNP transistors
(2) NPN transistors
(3) Thermionic valves
(4) Unijunction transistors

31. As compared to power MOSEFT a BJT has :
(1) Lower switching losses but higher conduction losses
(2) Higher switching losses and higher conduction losses
(3) Higher switching losses but lower conduction losses
(4) Lower switching losses and lower conduction losses

32. An IGBT has three terminals called :
(1) Collector, Emitter and Base
(2) Drain, Source and Base
(3) Drain, Source and Gate
(4) Collector, Emitter and Gate

33. An MCT has three terminals called :
(1) Anode, Cathode and Gate
(2) Collector, Emitter and Gate
(3) Drain, Source and Base
(4) Drain, Source and Gate

34. In the conduction mechanism Schottky diode :
(1) Only electrons can participate
(2) Only holes can participate
(3) Both holes and electrons participate
(4) Only protons can participate

35. The selection of rectifier diode depends mostly on :
(1) Forward voltage
(2) Reverse voltage
(3) Fault current
(4) Average load current

36. A torque can develop due to interaction between two coil currents, if these are :
(1) along the same axis
(2) in quadrature
(3) 180° away from each other
(4) 45° away from each other

37. The torque produced in a 4-pole machine is 100 Nm. If this machine is rewound with 6-poles, other things remaining unchanged, then the torque produced would be :
(1) 66.67 Nm
(2) 100 Nm
(3) 150 Nm
(4) 133.33 Nm

38. A separately excited d.c. generator is running at rated speed and at no-load. If its field is winding is suddenly connected to a d.c. source, then rise in armature generated voltage is governed by :
(1) Armature time constant
(2) Field time constant
(3) Both armature and field time constants
(4) Mechanical time constant

39. The function of equalizing connections of a lap wound d.c. generator is :
(1) to avoid short circuit current
(2) to neutralize the armature reaction
(3) to avoid unequal distribution of currents at brushes
(4) none of the above

40. A d.c. shunt generator is floating on the bus bar. It can be loaded by :
(*i*) Increasing its driving torque
(*ii*) Decreasing its driving torque
(*iii*) Increasing its field current
(*iv*) Decreasing its field current
From the above the *correct* answer is :
(1) (*ii*), (*iii*)
(2) (*ii*), (*iv*)
(3) (*i*), (*iv*)
(4) (*i*), (*iii*)

41. For successful parallel operation of d.c. generators, equalizer is required for :
(1) Series generators only
(2) Over compounded generators only
(3) Series and over compounded generators
(4) Series and under compounded generators

42. Plugging of d.c. motors carried out by :
(1) Reversing both the field and armature polarities
(2) Reversing only the field polarity
(3) Reversing only the armature polarity
(4) Disconnecting the armature from supply and connectivity it across a resistance

43. For continuously running rolling mills with intermittent loading, the most suitable d.c. drive is a :
(1) D.C. series motor
(2) D.C. shunt motor
(3) D.C. differentially compounded motor
(4) D.C. cumulatively compounded motor coupled to a heavy fly wheel

44. Neglecting all losses the developed torque (T) if a d.c. separately excited motor operating under constant power (P) as under :
(1) $T \propto \sqrt{P}$
(2) $T \propto P$
(3) $T^2 \propto P^3$
(4) T independent

45. SCR for a synchronous machine is the reciprocal of :

(*i*) X_d in Ω

(*ii*) X_d in p.u

(*iii*) X_s in Ω

(*iv*) X_s in p.u

From the above the correct answer is :

(1) (*i*) and (*iii*)

(2) (*ii*) and (*iv*)

(3) (*i*) and (*iv*)

(4) (*ii*) and (*iii*)

46. The following method is best suited for finding the voltage regulation of an alternator :

(1) Synchronous impedance method

(2) Potier triangle method

(3) M. M. F. method

(4) None of the above

47. A 3-phase, 4 pole, 24 slot alternator has its armature coils short circuited by one slot. The pitch factor becomes :

(1) 0.94

(2) 0.96

(3) 0.98

(4) 1.00

48. A synchronous machine with large SCR has :

(1) Poor voltage regulation

(2) Poor stability

(3) Low short circuit current

(4) More synchronous power

49. In a 3-phase synchronous machine, if its air gap length is increased, then for the same excitation voltage, its cost :

(1) increases

(2) decreases

(3) is unaffected by an air-gap length

(4) may increase or decrease

50. During 3-phase short circuit test on an unloaded alternator, the d.c. component may be zero in..... .

(1) one phase only

(2) any two phases

(3) all the three phases

(4) none of the phases

51. The armature time constant T_a is applicable to :

(1) DC component of armature current

(2) Second harmonic component of armature current

(3) Fundamental frequency component of armature current

(4) Fundamental frequency component of field current

52. The various components of armature short circuit current of a 3 phase alternator without amortissuer windings :

(*i*) Subtransient component

(*ii*) Transient component

(*iii*) Second harmonic component

(*iv*) DC component

(*v*) Fundamental Frequency Component

From the above, the *correct* answer is :

(1) All the five

(2) (*i*), (*ii*) and (*iii*)

(3) (*i*), (*ii*), (*iii*) and (*iv*)

(4) (*ii*), (*iii*), (*iv*) and (*v*)

53. A synchronous generator has higher power handling capability when operating at :
(1) a leading pf
(2) a lagging pf
(3) it does not depend upon the pf of the generator
(4) it depends upon the load pf, as generator has no pf of its own

54. In synchronous machine connected to an infinite bus, if rotor speed departs from synchronous speed then :
(1) damping power comes into play
(2) synchronizing power comes into play
(3) both (1) and (2)
(4) none of the above

55. In a synchronous machine connected to an infinite bus, if rotor speed departs from synchronous speed, then the rotor oscillations can be investigated by including the :
(*i*) damping power
(*ii*) synchronous power
(*iii*) inertia power
(*iv*) shaft power
From above, the *correct* answer is :
(1) all of the above
(2) (*i*), (*ii*) and (*iii*)
(3) (*i*), (*ii*) and (*iv*)
(4) (*ii*), (*iii*) and (*iv*)

56. An alternator of frequency 50.2 Hz is to be synchronized with an infinite bus of frequency 50 Hz by means of three dark lamp method. The lamp flicker per minute will be :
(1) 6
(2) 25
(3) 30.6
(4) 12

57. An alternator with frequency f_1 is to be synchronized with an infinite bus of frequency f for proper synchronization :
(1) $f_1 = f$
(2) $f_1 < f$
(3) $f_1 > f$
(4) either (2) or (3)

58. A 3-phase alternator with line voltage V_1 is to be synchronized with infinite bus the maximum value of r.m.s voltage across synchronizing switch would be :
(1) $\sqrt{3}\ V_1$
(2) $2\ V_1$
(3) $(2\ V_1)/\sqrt{3}$
(4) $(\sqrt{3}\ V_1)/2$

59. One alternator, with subtransient reactance of 0.25 p.u. is to be synchronized with infinite bus by three dark lamp method. If the synchronizing switch is closed when the lamps are the brightest then the synchronizing current would be :
(1) 2 p.u
(2) 4 p.u
(3) 5 p.u
(4) 8 p.u

60. The division of active power amongst alternators running in parallel depends upon :
(1) Speed load characteristics of prime movers
(2) Volt-Ampere characteristics of alternators
(3) Excitation e.m.fs of alternators
(4) All of the above

61. The division of reactive power amongst alternators running in parallel depends upon :
(*i*) Speed load characteristics of prime movers
(*ii*) Volt-Ampere characteristics of alternators
(*iii*) Excitation voltages of alternators
From these, the *correct* answer is :
(1) (*i*) and (*ii*)
(2) (*i*) and (*iii*)
(3) (*ii*) and (*iii*)
(4) all of the above

62. An alternator is synchronized with infinite bus. Now if its field current is decreased, then its armature current :
(1) Increases with zero pf lagging
(2) Decreases with zero pf leading
(3) Increases with zero pf leading
(4) Increases at any value or pf

63. With a single alternator connected to infinite busbar supplies a local load, the change in excitation of the machine results in change of :
(1) power factor
(2) power output
(3) input power
(4) terminal voltage

64. A 3-phase synchronous machine is synchronized with infinite bus. Now the prime mover is disconnected from the synchronous machine. With this, the synchronous machine would :
(1) Work as a synchronous motor at a leading pf
(2) Work as a synchronous motor at a lagging pf
(3) Work as a 3 phase induction motor at a lagging pf
(4) Stop

65. A 3 phase synchronous machine is synchronized with an infinite bus. Now steam input to synchronous machine is increased. With this, synchronous machine starts working as :
(1) Alternator at a leading pf
(2) Alternator at a lagging pf
(3) Synchronous motor at a leading pf
(4) Induction generator at a lagging pf

66. A 3 phase alternator is supplying power to infinite generator at a lagging pf with constant steam input, alternator excitation is increased. With this :
(1) load angle δ decreases and pf increases
(2) δ increases and pf decreases
(3) both δ and pf decrease
(4) both δ and pf increase

67. A synchronous machine has excitation voltage of $0.8\angle 15^\circ$ and the infinite bus voltage of $1.0\angle 0^\circ$. The synchronous machine is working as :
(1) an alternator and delivers reactive power at leading pf
(2) an alternator absorbs reactive power at leading pf
(3) a synchronous motor and delivers reactive power at leading pf
(4) a synchronous motor and absorbs reactive power at lagging pf

68. In parallel operation of alternators, the synchronizing power is maximum if armatures have :
(1) reactances equal to resistances
(2) reactances less than resistances
(3) reactances greater than resistances
(4) none of the above

69. If two alternators A and B of same rating and power factors 0.6 lagging and 0.4 leading respectively are connected in parallel, the overall p.f. is :
(1) leading
(2) lagging and greater than 0.6
(3) lagging and less than 0.6
(4) unity

70. Two alternators A and B, running in parallel, supplies power to a resistive load. For the same terminal voltage and steam inputs, if excitation of alternator A is increased, then :
(1) A will supply lagging KVAR
(2) B will supply leading KVAR
(3) As load is resistive, B cannot supply lagging KVAR
(4) As load is resistive, B cannot supply leading KVAR

71. Two alternators A and B, running in parallel, supplies power P to a resistive load. Then two alternators share equal powers. For the same load power P, driving torque of alternator A is increased while that B is suitably adjusted. With this :
(1) A supplies reactive power to load
(2) B absorbs reactive power from load
(3) B delivers reactive power to A
(4) As load is resistive, no reactive power flow exists

72. The maximum torque that a synchronous motor can deliver is proportional to :
(1) $1/V^2$
(2) $1/V$
(3) V
(4) V^2

73. When zero-sequence currents are flowing in the armature winding of a synchronous machine, the nature of air gap field is :
(1) Rotating with constant amplitude
(2) Stationary but pulsating
(3) Pulsating but rotating
(4) Stationary with constant amplitude

74. When negative sequence currents are flowing in the armature winding of a synchronous machine, the nature of air gap field is :
(1) Rotating with constant amplitude against the direction of rotation
(2) Rotating with varying amplitude against the direction of rotation
(3) Rotating with constant amplitude in the direction of rotation
(4) Stationary but pulsating

75. In a three phase induction motor coupled with constant torque load, if supply voltage is kept constant but supply frequency is reduced below the rated value, then :
(1) Starting test $T_{e,st}$ and pull out $T_{e,m}$ torques are reduced
(2) Motor output is reduced but $T_{e,st}$ is increased
(3) Motor output is reduced but both $T_{e,st}$ and $T_{e,m}$ are increased
(4) Motor output as well as $T_{e,st}$ and $T_{e,m}$ are increased

76. In a 3 phase induction motor, if supply voltage and supply frequency are reduced by the same degree, then under maximum torque conditions :
(1) Motor current decreases and pf is improved
(2) Motor current increases and pf is improved
(3) Motor current decreases and pf is worsened
(4) Motor current increases and pf is worsened

77. The following method is preferred for speed control of cage rotor induction motor :
(1) Ward Leonard method
(2) Ship recovery method
(3) Pole changing method
(4) Voltage injection in rotor circuit

78. For 4% drop in supply voltage, the torque of an induction motor decreases by :
(1) 4%
(2) 8%
(3) 16%
(4) 7.84%

79. In a 3 phase Induction motor, a deep bar rotor is used for obtaining :
(1) more operating efficiency
(2) more starting torque
(3) more pull out torque
(4) reduced rotor core loss

80. In a polyphase single cage induction motor (SCIM) increased starting torque can be obtained by :
(*i*) increasing the frequency of operation
(*ii*) using deep bar rotors
(*iii*) increasing the number of poles
(*iv*) using a double cage rotor
from these, the correct answer is :
(1) (*i*), (*ii*) and (*iii*)
(2) (*i*), (*iii*) and (*iv*)
(3) (*ii*), (*iii*), and (*iv*)
(4) (*ii*) and (*iv*)

81. In a polyphase IM using double-cage, the rotor current flows mainly through the :
(*i*) upper cage at starting
(*ii*) lower cage at starting
(*iii*) upper cage at normal speed
(*iv*) lower cage at normal speed
From the above the correct answer is :
(1) (*i*) and (*iii*)
(2) (*i*) and (*iv*)
(3) (*ii*) and (*iii*)
(4) (*ii*) and (*iv*)

82. In a double-cage IM the inner cage and outer cage have respectively :
(1) low r, high x and low r, high x
(2) low r, low x and high r, low x
(3) low r, high x and high r, low x
(4) high r, low x and low r, high x

83. Speed control in a 3-phase IM by pole changing method is applicable to :
(1) both squirrel cage (SCIM) and slipring (SRIM) Induction motors
(2) SRIM only
(3) SCIM only
(4) SRIM of small rating

84. Line voltage control for the speed regulation of a 3-phase SCIM is not so important because this method offers :
(1) Limited range of speed control
(2) Low operating efficiency
(3) Low pull out torque
(4) All of the above

85. For a poly-phase SRIM when low speed is obtained by rotor resistance control, then :
(1) Starting torque $T_{e,st}$ is low and efficiency is low
(2) $T_{e,st}$ is more and efficiency is low
(3) Both $T_{e,st}$ and efficiency are high
(4) $T_{e,st}$ is low and efficiency is more

86. In a 3-phase IM speeds higher than synchronous speeds can be obtained by :
(1) Supply frequency control
(2) Supply voltage control
(3) Rotor resistance control
(4) Rotor slip-power control

87. The rotor output of a 3-phase induction motor is 15 kW and the slip is 4%, then the rotor copper loss is :
(1) 600 watts
(2) 300 watts
(3) 700 watts
(4) 1200 watts

88. In a 3-phase Induction motor, plugging requires that :
(1) Any two stator supply leads are short circuited
(2) Any two stator supply leads are interchanged
(3) Any two stator terminals are fed with d.c
(4) D.C. is fed to two terminals obtained from 3-phase terminals

89. D.C. dynamic braking is obtained by :
(1) Feeding d.c. to stator circuit
(2) Feeding d.c. to rotor circuit
(3) Interchanging any two stator supply terminals
(4) Interchanging any two rotor terminals

90. A single phase induction motor is provided with a 3-phase slip ring rotor connected to a starting resistance. This motor would :
(1) Not start
(2) Result in more starting torque
(3) Produce no difference in the starting torque
(4) Run at half the synchronous speed

91. The low power factor of a 3-phase induction motor at low load results from :
(1) high speed
(2) low magnetising component of I_0
(3) high magnetising component of no load current I_0
(4) high working component of I_0

92. In a polyphase IM, the rotor slots are skewed by :
(*i*) one slot-pitch
(*ii*) two slot-pitch
(*iii*) one harmonic pole pitch
(*iv*) two harmonic pole pitch
From the above the *correct* answer is :
(1) (*i*) and (*ii*)
(2) (*iii*) and (*iv*)
(3) (*i*) and (*iv*)
(4) (*ii*) and (*iv*)

93. Crawling in a 3-phase IM may be due to :
(*i*) harmonic induction torque
(*ii*) harmonic synchronous torque
(*iii*) broken end-ring
(*iv*) broken rotor bar
From the above the *correct* answer is :
(1) (*i*) and (*iii*)
(2) (*ii*) and (*iv*)
(3) all of the above
(4) none of the above

94. A single phase induction motor is labelled 1 and a 3-phase induction motor is labelled 2. When slip is zero :
(1) Torque is non-zero in both motors 1 and 2
(2) Torque is non-zero but positive in both motors
(3) Torque is non-zero negative in motor 1 and zero in motor 2
(4) Torque is non-zero negative in motor 1 and non-zero positive in motor 2

95. In various types of split phase induction motors the starting torques produced are in the following descending order :
(1) capacitor-split, resistor split, shaded pole
(2) capacitor-split, shaded pole, resistor split
(3) resistor split, capacitor split, shaded pole
(4) shaded pole, resistor split, capacitor split

96. In a capacitor-split motor if C_1 is the capacitance required for the best starting torque and C_2 for the best running performance, then :
(1) C_1 is much smaller that C_2
(2) C_1 is almost equal to C_2
(3) C_1 is much larger than C_2
(4) C_1 and C_2 may have any value

97. In capacitor start and run 1-phase induction motors starting capacitor C_1 and permanent capacitor C_2 are as under :
(1) C_1-electrolytic type; C_2-mica type
(2) C_1-mica type; C_2-electrolytic type
(3) C_1-electrolytic type; C_2-paper type
(4) C_1-paper type; C_2-electrolytic type

98. The direction of rotation of a 1-phase induction motor can be reversed by :
(1) Reversing the leads of main winding
(2) Reversing the leads of auxiliary winding
(3) Reversing the supply leads
(4) Either (1) or (2)

99. In a 1-phase induction motor, maximum starting torque may be obtained with auxiliary winding connected in series with :
(1) Resistor
(2) Capacitor
(3) Inductor
(4) R and L

100. The most suitable motor for a tape-recorder will be :
(1) a.c. series motor
(2) reluctance motor
(3) hysteresis motor
(4) 1-phase IM

101. The most suitable motor for a desk fan is :
(1) Shaded pole motor
(2) Reluctance motor
(3) Hysteresis motor
(4) 1-phase split phase motor

102. The function of compensating winding in a 1-phase series motor is to :
(1) Reduce the reactance drop
(2) improve the commutation
(3) reduce the reactance drop and degrade the commutation
(4) reduce the reactance drop and improve the commutation

103. A poly-phase doubly fed commutator motor has :
(1) Series speed-torque characteristics and offers constant torque drive system
(2) Shunt speed-torque characteristics and offers constant torque drive system
(3) Series speed-torque characteristics and offers constant power drive system
(4) Shunt speed-torque characteristics and offers constant power drive system

104. A Schrage motor is running as a 3-phase induction motor, if brush shift is in the direction of rotor rotation, then :
(1) speed rises and pf is worsened
(2) speed decreases and pf is worsened
(3) speed rises and pf is improved
(4) speed decreases and pf is improved

105. In a 3-phase core type transformer, the exciting currents for :
(1) three primaries are equal
(2) three primaries are unequal
(3) outer two primaries are less than the middle primary
(4) outer two primaries are more than the middle primary

106. A delta-star transformer 1 is operating in parallel with a star delta transformer 2. If primary to secondary turns ratio per phase for transformer 1 is k, then for transformer 2 the primary to secondary turns ratio per phase would be :
(1) k
(2) 3k
(3) k/3
(4) $k/\sqrt{3}$

107. For a sinusoidal magnetizing current in a single phase transformer the waveform of flux and induced emfs in both the windings are respectively :
(1) peaky, sinusoidal
(2) peaky, flat-topped
(3) flat-topped, peaky
(4) sinusoidal, peaky

108. In Scott-connected transformers, main transformer has unity turns ratio for secondary balanced load current of 10A, the primary current in amperes in the main and teaser transformers are respectively.
(1) 10, 10, 10
(2) 11.55, 11.55, 11.55
(3) 10, 10, 11.55
(4) 11.55, 11.55, 10

109. If a transformer is switched on when the applied voltage is maximum positive, then there occurs :
(1) no current inrush
(2) minimum current inrush
(3) average current inrush
(4) maximum current inrush

110. The flux responsible for the development of mechanical forces in transformers is :
(1) primary leakage flux
(2) total flux
(3) mutual flux
(4) leakage flux

111. When primary and secondary windings are not placed symmetrically with respect to the transformer core, the mechanical forces developed are :
(1) external axial forces
(2) external radial forces
(3) internal axial forces
(4) internal radial forces

112. In the per unit system, the base values chosen first are :
(1) volt ampere, voltage
(2) volt ampere, current
(3) voltage, current
(4) current, impedance

113. Can a 50 Hz transformer be used for 25 Hz, if the input voltage is maintained constant at the rated value corresponding to 50 Hz :
(1) Yes, since the voltage is constant, current levels will not change
(2) No, flux will be doubled which will drive the core to excessive saturation
(3) No, owing to decreased reactance of transformer input current will be doubled at load
(4) Yes, at constant voltage insulation will not be overstressed

114. For protection of parallel feeders fed from one end the relays required are :
(1) Non-directional relays at the source end the directional relays at the load end
(2) Non-directional relays at both the ends
(3) Directional relays at the source end and non-directional at the load end
(4) Directional relays at both the ends

115. A shunt fault is characterized by :
(1) Increase in current, frequency, p.f. and efficiency
(2) Increase in current, reduction in frequency and p.f.
(3) Increase in current and frequency but reduction in p.f
(4) Increase in voltage, reduction in current and impedance

116. The most economical load on an underground cable is :
(1) Greater than its surge loading
(2) Less than the surge loading
(3) Equal to the surge loading
(4) Greater than or equal to surge loading

117. The rate of rise of restriking voltage depends upon :
(1) switching condition only
(2) circuit power factor only
(3) both (1) and (2)
(4) none of the above

118. Where voltages are high and current to be interrupted is low, the breaker preferred is :
(1) Air Blast C.B
(2) Oil C.B
(3) Vacuum C.B
(4) SF_6 C.B

119. A fault is more severe from the view point of RRRV, if it is a/an :
(1) short line fault
(2) medium length line fault
(3) long line fault
(4) open circuit fault

120. Shunt compensation in an EHV line is resorted to :
(1) Improve the stability
(2) Reduce the fault level
(3) Improve the voltage profile
(4) As a substitute for synchronous phase modifier

121. The size of conductor on modern EHV lines is obtained based on :
(1) voltage drop
(2) current density
(3) corona
(4) both (1) and (2)

122. For stability and economic reasons we operate the transmission line with power angle in the range :
(1) 10° to 25°
(2) 30° to 45°
(3) 60° to 75°
(4) 65° to 80°

123. For a lumped inductive load with increase in supply frequency :
(1) P and Q increase
(2) P increases Q decreases
(3) P decreases Q increases
(4) P and Q decrease

124. A voltage controlled bus is treated as a load bus in subsequent iteration when its :
(1) voltage limit violated
(2) active power limit violated
(3) reactive power limit violated
(4) phase angle limit violated

125. The load flow solution is always assured in case of :
(1) Newton-Raphson method
(2) Gauss method
(3) Gauss-Siedel method
(4) None of the above methods guarantees

126. The positive sequence component of voltage at the point of fault is zero when it is a :
(1) 3-phase fault
(2) L-L fault
(3) L-L-G fault
(4) L-G fault

127. The cost of generation is theoretically minimum, if :
(1) The system constraints are considered
(2) The operational constraints are considered
(3) Both (1) and (2)
(4) The constraints are not considered

128. Load flow study is carried out for :
(1) Fault calculations
(2) Stability studies
(3) System planning
(4) Load frequency control

129. The diagonal elements of a nodal admittance matrix are strengthened by adding :
(1) shunt inductances
(2) shunt capacitors
(3) load
(4) generators

130. The normal practice to specify the making current of circuit breaker is in terms of :
(1) r.m.s. value
(2) peak value
(3) average value
(4) both r.m.s. and peak value

131. If the power transmitted along a transmission line at unity power factor is less than SIL, then the line appears :
(1) Resistor that dissipates power
(2) An inductance that consumes VAR's
(3) A capacitance that injects VAR's
(4) An inductance that injects VAR's

132. An induction motor may be made to generate a.c. power by :
(1) running it at a slip less than zero
(2) running it in a direction opposite to that of rotating field
(3) running it at synchronous speed
(4) connecting it in prarallel with an alternator

133. In planning machine drives the motor used is :
(1) Squirrel cage IM
(2) Deep Bar rotor IM
(3) DC compound motor
(4) DC series motor

134. In punches, presses and shears the following motors are used
(*i*) DC series motor
(*ii*) DC compound motor
(*iii*) SRIM without flywheel
(*iv*) SRIM with flywheel
From above choose the *correct* answer :
(1) (*i*) or (*iii*)
(2) (*ii*) or (*iii*)
(3) (*i*) or (*iv*)
(4) (*ii*) or (*iv*)

135. The ratio between the bandwidth of closed loop system to bandwidth of open loop system is :
(1) K
(2) 1 + K
(3) 1 – K
(4) 2 + K

136. In a closed loop control system, the feedback shall :
(*i*) Reducing sensitivity
(*ii*) Improving transient response
(*iii*) Minimizing the effects of disturbance signals
(*iv*) Reduces the gain of the system
(*v*) Introduces the possibility of instability
(*vi*) Increases the gain of the system
(1) (*i*), (*ii*), (*v*) and (*vi*)
(2) (*i*), (*ii*), (*iii*), (*iv*), (*v*) and (*vi*)
(3) (*i*), (*ii*), (*iii*), (*iv*) and (*v*)
(4) (*ii*), (*iii*), (*v*) and (*i*)

137. Regenerative feedback is used for :
(1) increasing gain
(2) increasing loop gain
(3) decreasing gain
(4) decreasing loop gain

138. Synchros are commercially known as :
(*i*) Selsyn
(*ii*) Autosun
(*iii*) Aerosyn
(*iv*) Delsyn
From the above which of the following is the correct answer ?
(1) (*i*) and (*iii*)
(2) (*ii*) and (*iv*)
(3) (*ii*) and (*iii*)
(4) (*i*) and (*ii*)

139. Unit-ramp input for type-1 system, the steady state error shall become :
(1) Infinity
(2) Zero
(3) Unity
(4) 0.5

140. Irrespective of initial conditions in the absence of the input, the output tends to zero. This stability concept is known as :
(1) Steady state stability
(2) Transient stability
(3) Asymptotic stability
(4) Relative stability

141. The relative stability of a control system is directly related to the location of :
(1) The open loop poles
(2) The open loop zeros
(3) The closed loop poles
(4) The closed loop zeros

142. Root locus technique is applicable for :
(*i*) SIMO system
(*ii*) MISO system
(*iii*) Single loop system
(*iv*) Multiple loop system
From the above the *correct* answer is :
(1) (*i*) and (*iv*)
(2) (*ii*) and (*iii*)
(3) (*ii*) and (*iv*)
(4) (*iii*) and (*iv*)

143. Time response analysis is suitable for the following input signals :
(*i*) Step Sinusoidal
(*ii*) Cosine wave
(*iii*) Ramp
(*iv*) Parabolic
From the above the correct answer is :
(1) (*ii*) only
(2) (*i*), (*iii*) and (*iv*)
(3) (*i*), (*v*) and (*iii*)
(4) (*i*), (*iv*) and (*v*)

144. Frequency response analysis is suitable for the following input signal :
(*i*) Step
(*ii*) Sinusoidal
(*iii*) Cosine wave
(*iv*) Ramp
(*v*) Parabolic
From the above the correct answer is :
(1) (*ii*) only
(2) (*i*), (*iii*) and (*iv*)
(3) (*i*), (*v*) and (*iii*)
(4) (*i*), (*iv*) and (*v*)

145. A transfer function which has one or more zeros in the right half s-plane is known as :
(1) minimum-phase transfer function
(2) All pass function
(3) Non-minimum phase transfer function
(4) Limited pass function

146. For the Nyquist stability criterion, computation of.....is not necessary :
(*i*) open loop zeros
(*ii*) open loop poles
(*iii*) closed loop zeros
(*iv*) closed loop poles
From the above the correct answer is :
(1) (*i*) and (*iii*)
(2) (*iv*) only
(3) (*ii*) only
(4) (*i*), (*ii*), (*iii*) and (*iv*)

147. Which compensator improves the steady-state behaviour of a system ?
(1) Lead compensator
(2) Lag compensator
(3) Lag-lead compensator
(4) PID compensator

148. Which compensator improves the transient response of the system ?
(1) Lead compensator
(2) Lag compensator
(3) Lag-lead compensator
(4) PID compensator

149. Which compensator improves both the transient and steady state response of the system ?
(1) Lead compensator
(2) Lag compensator
(3) Lag-lead compensator
(4) PID compensator

150. In torque-current analogy, which is the analogous quantity for mass (M) :
(1) Force
(2) Capacitance
(3) Voltage
(4) Velocity

Rough Work