Induction Motor MCQ PDF

1. The poly-phase induction motors are, by a very considerable margin, the most widely used ac motors as

(a) these are cheaper in cost, simple and rugged in construction and require little maintenance.

(b) they are capable of operation under a wide range of power factors both leading and lagging.

(c) they have maximum efficiency and maximum starting torque.

(d) they have very good speed regulation.

Answer: (a) these are cheaper in cost, simple and rugged in construction and require little maintenance.

2. Which of the following statements associated with polyphase induction motor is/are correct ?

(a) It can run in one direction only.

(b) It is simply a transformer whose magnetic circuit is separated by an air gap into two relatively movable portions, one carrying the primary and other the secondary winding.

(c) It needs more maintenance than that required by a dc shunt motor.

(d) It is more costly than a dc shunt motor of the same output rating.

Answer: (b) It is simply a transformer whose magnetic circuit is separated by an air gap into two relatively movable portions, one carrying the primary and other the secondary winding.

3. The stator frame in an induction motor is used to

(a) hold the armature stampings in position.

(b) ventilate the armature.

(c) protect the whole machine.

(d) provide return path for the flux.

Answer: (a) hold the armature stampings in position.

4. The frame of an induction motor is made of

(a) aluminum.

(b) silicon steel.

(c) closed grained cast iron.

(d) stainless steel.

(e) bronze.

Answer: (c) closed grained cast iron.

5. The stator core of a 3-phase induction motor is laminated in order to reduce the

(a) eddy current loss.

(b) hysteresis loss.

(c) both eddy current and hysteresis loss.

(d) weight of the stator.

(e) windage and frictional losses.

Answer: (a) eddy current loss.

6. Use of fractional pitch winding

(a) results in reduced leakage reactance.

(b) results in reduced axial length of the machine.

(c) makes it stiffer.

(d) all of the above.

Answer: (d) all of the above.

7. If all the stator coils of an induction motor are connected for the same magnetic polarity, there will be formed an equal number of

(a) rotor poles with same polarity.

(b) rotor poles with opposite polarity.

(c) consequent poles with opposite polarity.

(d) consequent poles with same polarity.

Answer: (c) consequent poles with opposite polarity.

8. The induction motor shaft should be

(a) hollow.

(b) stiff.

(c) flexible.

(d) any of these.

Answer: (b) stiff.

9. The induction motor shaft is made of

(a) mild steel.

(b) cast iron.

(c) high speed steel.

(d) stainless steel.

(e) aluminum.

Answer: (a) mild steel.

10. Induction motors normally use die-cast aluminum rotor because aluminum is

(a) cheaper in cost.

(b) lighter in weight.

(c) easy to cast owing to its low melting point and is easily available.

(d) of low resistivity.

Answer: (c) easy to cast owing to its low melting point and is easily available.

11. In a 3-phase squirrel cage induction motor

(a) rotor conductors are short circuited through end rings.

(b) rotor conductor ends are short circuited through slip rings.

(c) rotor conductors are kept open.

(d) none of the above.

Answer: (a) rotor conductors are short circuited through end rings.

12. The squirrel cage rotor of a 6-pole induction motor can be used for induction motor.

(a) only 6-pole

(b) 6 or 12 pole

(c) any number of poles in an

(d) none of the above

Answer: (c) any number of poles in an

13. The squirrel cage induction motors are provided with blades in order to

(a) facilitate cooling of rotor.

(b) balance the rotor dynamically.

(c) eliminate noise.

(d) none of these.

Answer: (a) facilitate cooling of rotor.

14. The rotor winding for a 3-phase slip-ring induction motor having delta-connected stator must be connected in

(a) delta.

(b) star.

(c) delta or star according to need.

(d) none of the above.

Answer: (b) star.

15. In a 3-phase wound rotor induction motor the short-circuit gear is used to short circuit the

(a) stator phases of the motor.

(b) rotor at slip rings.

(c) starting resistances in the starter.

(d) none of the above.

Answer: (b) rotor at slip rings.

16. Uneven gap in an induction motor is likely to cause

(a) heating of motor.

(b) unbalancing of motor shaft.

(c) both (a) and (b).

(d) none of these.

Answer: (c) both (a) and (b).

17. A smaller air gap in a poly-phase induction motor helps to

(a) reduce the chance of crawling.

(b) increase the starting torque.

(c) reduce the chance of cogging.

(d) reduce the magnetizing current.

Answer: (d) reduce the magnetizing current.

18. In an induction motor, if the air gap is increased

(a) its speed will reduce.

(b) its efficiency will improve.

(c) its power factor will reduce.

(d) its breakdown torque will reduce. [I.E.S. E.E.-II, 2004]

Answer: (c) its power factor will reduce.

19. Which of the following parameters in an induction motor influences the magnetizing reactance to the maximum extent?

(a) Axial length of the rotor stack.

(b) Axial length of the stator stack.

(c) Radial length of air gap.

(d) Number of slots on the stator. [I.E.S. 2006]

Answer: (c) Radial length of air gap.

20. In an induction motor, the air gap flux density is usually kept low so as to

(a) improve efficiency.

(b) improve power factor.

(c) reduce machine cost.

(d) none of the above.

Answer: (b) improve power factor.

21. A 3-phase, 4-pole squirrel cage induction motor has 36 stator and 28 rotor slots. The number of phases in the rotor is

(a) 3

(b) 9

(c) 7

(d) 8 [GATE E.E. 2000]

Answer: (a) 3

22. The rotor slots are slightly skewed in squirrel-cage induction motor to

(a) increase the strength of rotor bars.

(b) reduce the magnetic hum and locking tendency of rotor.

(c) economize on the copper to be used.

(d) provide ease of fabrication. [I.E.S. E.E. II, 2003]

Answer: (b) reduce the magnetic hum and locking tendency of rotor.

23. Skewing of the rotor in a three-phase squirrel-cage induction motor reduces

(a) noise, parasitic torque, starting torque and pull-out torque.

(b) noise and parasitic torque, but increases starting torque and pull-out torque.

(c) noise and pullout torque, but increases parasitic torque and starting torque.

(d) noise, parasitic torque and starting torque, but increase pull-out torque. [U.P.S.C. I.E.S. 2001]

Answer: (a) noise, parasitic torque, starting torque and pull-out torque.

24. Consider the following statements:

Skewing of rotor slots in a 3-phase induction motor (cage rotor) may

1. introduce additional leakage reactance.

2. eliminate slot harmonics.

Which of the statements given above is/are correct?

(a) 1 only.

(b) 2 only.

(c) Both 1 and 2.

(d) Neither 1 nor 2. [I.E.S. E.E.-II, 2005]

Answer: (c) Both 1 and 2.

25. Which one of the following is the correct statement: In a 3-phase induction motor, the resultant flux is of a constant nature and is

(a) equal to ϕ_m, where ϕ_m is maximum flux due to any phase.

(b) 1.5 times maximum value of flux due to any phase.

(c) $\sqrt{3}/2$ times maximum value flux due to any phase.

(d) $3\phi_m$. [I.E.S. E.E.-II, 2007]

Answer: (b) 1.5 times maximum value of flux due to any phase.

26. The principle of operation of a 3-phase induction motor is almost similar to that of

(a) synchronous motor.

(b) repulsion start induction motor.

(c) transformer with a shorted secondary.

(d) capacitor-start induction motor.

Answer: (c) transformer with a shorted secondary.

27. The rotor of a 3-phase induction motor rotates in the same direction as that of stator rotating field. This can be explained by

(a) Faraday's laws of electromagnetic induction.

(b) Lenz's law.

(c) Newton's laws of motion.

(d) Fleming's right hand rule.

Answer: (b) Lenz's law.

28. The relative speed between stator and rotor fluxes is equal to

(a) synchronous speed, N_s.

(b) rotor speed, N.

(c) zero.

(d) N_s—N.

Answer: (c) zero.

29. Stator flux induces emf in the rotor bars

(a) rotating at synchronous speed around stator.

(b) constant in magnitude.

(c) magnitude depending upon the load on the motor.

(d) none of the above.

Answer: (c) magnitude depending upon the load on the motor.

30. The rotor circuit of an induction motor under operating condition is

(a) always closed.

(b) always open.

(c) may be open or closed depending upon the loading conditions.

Answer: (a) always closed.

31. The 3-phase induction motor with rotor circuit open will

(a) run normally.

(b) get overheated.

(c) not run.

(d) make noise.

Answer: (c) not run.

32. If any two leads from slip rings are interchanged in a 3-phase induction motor, the motor will

(a) continue running in the same direction as before.

(b) run in a direction opposite to previous one.

(c) not run.

(d) get damaged.

Answer: (a) continue running in the same direction as before.

33. Two of the supply terminals to a 3-phase induction motor get interchanged during reconnection after normal maintenance. When switched on to supply, the motor will

(a) rotate in the same direction as before maintenance.

(b) rotate in direction opposite to that before maintenance.

(c) not start at all.

(d) get heated and damaged.

Answer: (b) rotate in direction opposite to that before maintenance.

34. The direction of rotation of a 3-phase induction motor can be reversed by

(a) transposing any two leads from supply.

(b) transposing any two leads from slip-rings.

(c) transposing all the three leads from the supply.

(d) disconnecting any one phase.

Answer: (a) transposing any two leads from supply.

35. The rotor of an induction motor rotates in the direction of the rotation of stator field in order to

(a) reduce the relative speed between the rotating stator field and the stationary rotor conductors.

(b) oppose the rotor current.

(c) increase the relative speed between the rotating stator field and stationary rotor conductors.

(d) none of the above.

Answer: (a) reduce the relative speed between the rotating stator field and the stationary rotor conductors.

36. The rotor of an induction motor never runs at synchronous speed, because then the relative speed between the rotating flux and rotor will be

(a) maximum and hence, torque will he maximum.

(b) maximum and hence, torque will be zero.

(c) zero and hence, torque will be maximum.

(d) zero and hence, torque will be zero. [A.M.I.E. Sec. B. Elec. Machines Summer 2004]

Answer: (d) zero and hence, torque will be zero.

37. The voltage actually used for setting up of the useful flux in the air gap of 3-phase induction motor is

(a) = applied voltage.

(b) > applied voltage.

(c) < applied voltage.

(d) = rotor induced emf. [I.E.S. E.E.-II, 2006]

Answer: (a) = applied voltage.

38. If N_s is the synchronous speed, N is the rotor speed and s is the slip then relation is

(a) $N_s = (1 — s) N$

(b) $N = sN_s$

(c) $N = (s — 1) N_s$

(d) None of these.

Answer: (d) None of these.

39. The maximum possible speed of a 3-phase squirrel cage induction motor running at a slip of 4% is

(a) 2,880 rpm.

(b) 3,000 rpm.

(c) 1,440 rpm.

(d) 960 rpm.

Answer: (a) 2,880 rpm.

40. A three-phase 6 pole, 50 Hz, induction motor is running at 5% slip. What is the speed of the motor?

(a) 850 rpm.

(b) 900 rpm.

(c) 950 rpm.

(d) 1000 rpm. [I.E.S. E.E.-II, 2009]

Answer: (c) 950 rpm.

41. At the instant of starting, the per unit slip of the 3-phase induction motor is

(a) 0.05

(b) 0.1

(c) 1.0

(d) 0.5

Answer: (c) 1.0

42. A balanced 3-phase induction motor runs at slip s. If ω_s is its synchronous speed, what is the relative speed between the stator mmf and rotor mmf ?

(a) $s\omega_s$

(b) $(1 — s)\omega_s$

(c) ω_s

(d) zero [I.E.S. E.E.-II, 2008]

Answer: (d) zero

43. A three-phase 440 V, 6 pole, 50 Hz, squirrel cage induction motor is running at a slip of 5%. The speed of stator magnetic field with respect to rotor magnetic field and speed of rotor with respect to stator magnetic field are

(a) zero, —50 rpm

(b) zero, 950 rpm

(c) 1,000 rpm, —50 rpm

(d) 1,000 rpm, 950 rpm [GATE E.E., 2011]

Answer: (a) zero, —50 rpm

44. The rotor of a three phase, 5 kW, 400 V, 50 Hz, slip ring induction motor is wound for 6 poles while its stator is wound for 4 poles. The approximate average no load steady state speed when this motor is connected to 400 V, 50 Hz supply is

(a) 1,500 rpm.

(b) 500 rpm.

(c) 0 rpm.

(d) 1,000 rpm. [GATE E.E. 2002]

Answer: (c) 0 rpm.

45. If the full-load speed of a 6-phase, 50 Hz induction motor is 950 rpm, what is its half-load speed nearly equal to ?

(a) 1,000 rpm.

(b) 450 rpm.

(c) 1,900 rpm.

(d) 975 rpm.

Answer: (d) 975 rpm.

46. The direction of rotation of a 3-phase induction motor is clockwise when it is supplied with 3-phase sinusoidal voltage having phase sequence A-B-C. For counterclockwise rotation of the motor, the phase sequence of the power supply should be

(a) B-C-A

(b) C-A-B

(c) A-C-B

(d) B-C-A and C-A-B [GATE E.E. 2004]

Answer: (c) A-C-B

47. The mmf produced by the current of a 3-phase induction motor

(a) rotates at the speed of rotor in the air gap.

(b) is standstill with respect to stator mmf.

(c) rotates at slip speed with respect to stator mmf.

(d) rotates at synchronous speed with respect to rotor. [I.E.S. E.E.-11, 2000]

Answer: (b) is standstill with respect to stator mmf.

48. The mmf produced by the rotor currents of a 3-phase induction motor

(a) rotates at the speed motor in the air gap.

(b) is at standstill with respect to stator mmf.

(c) rotates at slip speed with respect to stator mmf.

(d) rotates at synchronous speed with respect to rotor. [I.E.S. E.E.-II, 2010]

Answer: (b) is at standstill with respect to stator mmf.

49. A 6-pole, 50 Hz wound rotor induction motor when supplied at the rated voltage and frequency with slip-rings open circuited, developed a voltage of 100 V between any two slip rings. If the rotor is driven by an external means at 1,000 rpm opposite to the direction of stator field, the frequency of voltage across slip rings will be

(a) zero.

(b) 50 Hz

(c) 100 Hz

(d) 200 Hz [I.E.S. E.E.-II, 2000]

Answer: (c) 100 Hz

50. In an induction motor the slip will be negative when

(a) stator magnetic field and rotor rotate in opposite directions.

(b) rotor rotates at a speed less than synchronous speed and in the direction of rotation of stator field.

(c) rotor rotates at a speed more than synchronous speed and in the direction of rotation of stator field.

(d) none of the above.

Answer: (c) rotor rotates at a speed more than synchronous speed and in the direction of rotation of stator field.

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

(a) 2 — s

(b) 2 + s

(c) 1 + s

(d) 1 — s

Answer: (a) 2 — s

52. The speed of rotating field due to rotor currents relative to rotor surface in an induction motor is

(a) N_s

(b) s N_s

(c) N

(d) s N

Answer: (b) s N_s

53. The relationship between rotor frequency f_2, slip s and the stator supply frequency f_1 is given by

(a) $f_1 = sf_2$

(b) $f_2 = sf_1$

(c) $f_2 = f_1(1—s)$

(d) $f_2 = \sqrt{(sf)}$ [A.M.I.E. Sec B. Elec. Machines Summer 1995]

Answer: (b) $f_2 = sf_1$

54. What is the frequency of rotor current of a 50 Hz induction motor operating at 2% slip ?

(a) 1 Hz

(b) 100 Hz

(c) 2 Hz

(d) 50 Hz [I.E.S. E.E.-II, 2007]

Answer: (a) 1 Hz

55. An induction motor having 8 poles runs at 727.5 rpm. If the supply frequency is 50 Hz, the emf in the rotor will have a frequency of

(a) 1.5 Hz

(b) 48.5 Hz

(c) 5.15 Hz

(d) 75 Hz [I.E.S. E.E.-II, 2003]

Answer: (a) 1.5 Hz

56. A 6-pole, 3-phase alternator running at 1,000 rpm supplies to an 8-pole, 3-phase induction motor which has a rotor current of frequency 2 Hz. The speed at which the motor operates is

(a) 1,000 rpm.

(b) 960 rpm.

(c) 750 rpm.

(d) 720 rpm. [I.E.S. E.E.-II, 2002]

Answer: (d) 720 rpm.

57. A voltmeter gives 120 oscillations per minute when connected to the rotor of an induction motor. The frequency is 50 Hz. The slip of the motor is

(a) 2%

(b) 4%

(c) 5%

(d) 25% [I.E.S. E.E.-1-1, 1995, 2000]

Answer: (b) 4%

58. The frequency of rotor currents at standstill is equal to

(a) zero

(b) 2f

(c) f

(d) sf

Answer: (c) f

59. The rotor of a 4-pole, 50 Hz, 3-phase slip-ring induction motor runs in clockwise direction when its stator terminals 1,2,3 are connected to supply terminals A, B, C respectively. If 1,2,3, are connected to A, C, B, respectively of supply terminals and rotor runs in a clockwise direction at synchronous speed, then the frequency of induced emf across the open-circuited rotor terminals is

(a) 50 Hz

(b) zero

(c) 25 Hz

(d) 100 Hz [A.M.I.E. Elec. Science Winter 1993]

Answer: (d) 100 Hz

60. In a slip-ring induction motor, the frequency of rotor currents can be measured with a

(a) galvanometer.

(b) wattmeter

(c) dc moving coil milli-voltmeter.

(d) none of the above.

Answer: (c) dc moving coil milli-voltmeter

61. A centre zero ammeter connected in the rotor circuit of a 6-pole, 50 Hz induction motor makes 30 oscillations in one minute. The rotor speed is

(a) 970 rpm.

(b) 990 rpm.

(c) 1010 rpm.

(d) 1030 rpm. [U.P.S.C. 1995]

Answer: (b) 990 rpm.

62. For an induction motor under operating condition, the emf induced/phase in rotor circuit is its standstill rotor induced emf per phase.

(a) equal to

(b) s times

(c) (1—s) times

(d) 1/s times.

Answer: (b) s times

63. The direction of rotor current produced in an induction motor can be determined by

(a) Lenz's law.

(b) Induction law.

(c) Fleming's right hand rule.

(d) Fleming's left hand rule.

Answer: (c) Fleming's right hand rule.

64. In case of an induction motor the leakage flux is more in comparison to that of a transformer. This is due to

(a) revolving rotor.

(b) air gap between rotor and stator.

(c) higher flux densities in induction motor.

(d) none of the above.

Answer: (b) air gap between rotor and stator.

65. In an induction motor the phase reactance is …….. in comparison to phase resistance.

(a) quite high

(b) very small

(c) slightly high

(d) almost same

Answer: (a) quite high

66. In a 3-phase induction motor reactance under running condition is less than its standstill value. This is due to reduction in

(a) rotor inductance.

(b) stator magnetic flux.

(c) frequency of rotor emf.

(d) mutual flux linking the stator and rotor.

Answer: (c) frequency of rotor emf.

67. In an induction motor under running condition, the rotor reactance per phase is ……. its standstill phase reactance.

(a) **s** times

(b) equal to

(c) 1/s times

(d) (1 - s) times

Answer: (a) s times

68. If E_2 is the standstill rotor phase emf, I_2 is the standstill rotor phase current and $\cos\varphi_2$ is the rotor power factor then torque developed by a 3-phase induction motor varies as

(a) E_2I_2

(b) $E_2I_2 \cos\phi_2$

(c) $E_2I_2 \div \cos\phi_2$

(d) $E_2 \div I_2\cos\phi_2$

Answer: (b) $E_2I_2 \cos\phi_2$

69. The torque developed by a 3-phase induction motor is approximately proportional to

(a) √s

(b) s^2

(c) s

(d) 1/s

Answer: (c) s

70. Insertion of resistance in the rotor circuit of an induction motor to develop a given torque causes …… in rotor current.

(a) almost no change

(b) increase

(c) decrease

(d) none of these

Answer: (a) almost no change

71. In an induction motor if the flux density is reduced to one-half of its normal value then the torque will

(a) reduce to one half.

(b) reduce to one-fourth.

(c) remain unchanged.

(d) increase four times.

Answer: (a) reduce to one half.

72. The torque developed in an induction motor is nearly proportional to

(a) 1/V

(b) V

(c) V^2

(d) none of these.

Answer: (c) V^2

73. If a 400 V, 50 Hz star-connected, 3-phase squirrel cage induction motor is operated from a 400 V, 75 Hz supply, the torque that the motor can now provide while drawing rated current from the supply

(a) reduces.

(b) increases.

(c) remains the same.

(d) increases or reduces depending upon the rotor resistance. [GATE E.E. 2002]

Answer: (a) reduces.

74. For a constant torque load, the supply voltage of a squirrel cage induction motor is reduced by a factor of $1/\sqrt{2}$, its rotor current is modified by a factor

(a) 2

(b) 1/√2

(c) √2

(d) none. [A.M.I.E. Sec. B. Elec. Machines Summer 1999]

Answer: (c) √2

75. The starting torque of a 3-phase induction motor varies as

(a) V^2

(b) V

(c) √V

(d) 1/V

Answer: (a) V^2

76. The starting torque of a squirrel cage induction motor is

(a) very large.

(b) very low.

(c) slightly more than full-load torque.

(d) zero.

Answer: (c) slightly more than full-load torque.

77. For achieving high starting torque and high operation efficiency an induction motor should have ……. rotor circuit resistance at starting and …… circuit resistance under operating condition.

(a) high, low

(b) low, high

(c) high, high

(d) low, low

Answer: (a) high, low

78. When the applied voltage per phase is reduced to one-half, the starting torque of a three-phase squirrel cage induction motor becomes

(a) 1/2 of the initial value.

(b) 1/4 of the initial value.

(c) twice of the initial value.

(d) 4 times of the initial value. [I.E.S. E.E.11, 2006]

Answer: (b) 1/4 of the initial value.

79. In a 3-phase induction motor, the starting torque will be maximum when

(a) $R_2 = 1/X_2$

(b) $R_2 = X_2$

(c) $R_2 = X_2^2$

(d) $R_2 = \sqrt{X_2}$

Answer: (b) $R_2 = X_2$

80. in a 3-phase induction motor, the maximum, torque

(a) is independent of rotor circuit resistance.

(b) varies as rotor resistance.

(c) varies as the square of rotor resistance.

(d) varies inversely as rotor circuit resistance.

Answer: (a) is independent of rotor circuit resistance.

81. For a slip-ring induction motor, if the rotor resistance is increased, then

(a) starting torque and efficiency increase.

(b) starting torque decreases but efficiency increases.

(c) starting torque increases but efficiency decreases.

(d) starting torque and efficiency decrease. [I.E.S. E.E.-II, 2005]

Answer: (c) starting torque increases but efficiency decreases.

82. An induction motor has a rotor resistance of 0.002 ohm/phase. If the resistance is increased to 0.004 ohm/phase then the maximum torque will

(a) reduce to half.

(b) increase by 100%.

(c) increase by 200%.

(d) remain unaltered. [U.P.S.C. I.E.S. 1994]

Answer: (d) remain unaltered.

83. In an induction motor, maximum torque varies as

(a) V/X_2

(b) V^2/X_2

(c) V/R_2

(d) V/X_2^2

Answer: (b) V^2/X_2

84. Breakdown torque of a 3-phase induction motor of negligible stator impedance is

(a) directly proportional to the rotor resistance.

(b) inversely proportional to the rotor resistance.

(c) directly proportional to the reactance.

(d) inversely proportional to the rotor leakage reactance. [I.E.S. E.E.-II, 1993, 2008]

Answer: (d) inversely proportional to the rotor leakage reactance. [I.E.S. E.E.-II, 1993, 2008]

85. Which one of the following statements is correct in respect of an induction motor?

(a) The maximum torque will depend on rotor resistance.

(b) Although the maximum torque does not depend on rotor resistance, yet the speed at which maximum torque is produced depends on rotor resistance.

(c) The maximum torque will not depend on standstill rotor reactance.

(d) The slip of induction motor decreases as torque increases. [I.E.S. 2003]

Answer: (b) Although the maximum torque does not depend on rotor resistance, yet the speed at which maximum torque is produced depends on rotor resistance.

86. In a 3-phase induction motor, the torque developed is maximum when the rotor circuit resistance per phase is equal to

(a) rotor leakage reactance per phase at standstill.

(b) slip times the rotor leakage reactance per phase at standstill.

(c) stator resistance per phase.

(d) stator leakage reactance per phase. [I.E.S. E.E.-II 2004]

Answer: (b) slip times the rotor leakage reactance per phase at standstill.

87. A 4-pole, 50 Hz, 3-phase induction motor has blocked rotor reactance per phase which is four times the rotor resistance per phase. The speed at which maximum torque develops is

(a) 1,125 rpm.

(b) 1,500 rpm.

(c) 1,050 rpm.

(d) 1,210 rpm. [U.P.S.C. I.E.S. E.E.-II, 2006]

Answer: (a) 1,125 rpm.

88. The supply voltage to an induction motor is reduced by 10%. By what percentage, approximately, will the maximum torque decrease?

(a) 50%

(b) 10%

(c) 20%

(d) 40% [I.E.S. E.E.-II, 2004]

Answer: (c) 20%

89. If the rotor circuit resistance is increased in an induction motor, the maximum torque will occur at

(a) lower speed.

(b) high speed.

(c) the same speed.

(d) none of these.

Answer: (a) lower speed.

90. Beyond the point of maximum torque any further increase in load will cause

(a) increase in torque developed and so the motor will run at a high speed.

(b) no change in the torque developed and so the motor will run at the same speed as before.

(c) decrease in torque developed and the motor will slow down.

(d) increase in current drawn from the supply mains resulting in damage to it.

Answer: (c) decrease in torque developed and the motor will slow down.

91. The torque-slip characteristic of a poly-phase induction motor becomes almost linear at small values of slip, because in this range of slips

(a) the effective rotor circuit resistance is very large compared to the rotor reactance.

(b) the rotor resistance is equal to the stator resistance.

(c) the rotor resistance is equal to the rotor reactance.

(d) the rotor resistance is equal to the stator reactance. [I.E.S. E.E.-II, 1993]

Answer: (a) the effective rotor circuit resistance is very large compared to the rotor reactance.

92. In a 3-phase induction motor if the leakage reactance is reduced by using open slots

(a) starting torque and starting current will decrease but power factor will increase.

(b) starting torque and starting current both will increase but power factor will decrease.

(c) pull-out torque will decrease.

(d) starting current will increase but starting torque will decrease. [AMIE. Sec B. Elec. Machine Design 1996]

Answer: (b) starting torque and starting current both will increase but power factor will decrease.

93. An increase in rotor circuit reactance of a 3-phase induction motor will

(a) reduce starting torque as well as maximum torque.

(b) increase starting torque as well as maximum torque.

(c) increase starting torque and reduce maximum torque.

(d) increase maximum torque and reduce starting torque.

Answer: (a) reduce starting torque as well as maximum torque.

94. The torque-slip characteristic of an induction motor is approximately a/an

(a) straight line.

(b) rectangular parabola.

(c) parabola.

(d) hyperbola.

Answer: (b) rectangular parabola.

95. Stable operation of an induction motor is

(a) between zero slip and unity/slip.

(b) between 0.5 slip and 0.95 slip.

(c) between zero slip and slip corresponding to maximum torque.

(d) between slip corresponding to maximum torque and unity slip.

Answer: (c) between zero slip and slip corresponding to maximum torque.

96. With the increase in load on a squirrel cage induction motor

(a) stator current increases.

(b) power factor improves.

(c) slip increases.

(d) the torque developed by the motor increases till it becomes equal to the load torque.

(e) all of the above.

Answer: (e) all of the above.

97. Whenever any poly-phase induction motor is loaded

(a) motor speed decreases.

(b) stator flux cuts the rotor bars more rapidly.

(c) emf induced in the rotor as well as its frequency increases.

(d) current in rotor bars increases.

(e) all of the above.

Answer: (e) all of the above.

98. The losses that occur in an induction motor are

(a) stator copper loss.

(b) stator iron loss.

(c) rotor copper loss.

(d) windage and friction losses.

(e) all of the above.

Answer: (e) all of the above.

99. In a 3-phase induction motor iron loss mainly occurs in

(a) stator and rotor.

(b) rotor core and rotor teeth.

(c) stator core and stator teeth.

(d) stator winding.

Answer: (c) stator core and stator teeth.

100. Iron loss in the rotor of a 3-phase induction motor is negligible. This is due to

(a) very low frequency of emf induced in the rotor.

(b) very low emf induced in the rotor.

(c) very low flux density in rotor parts.

(d) the fact that the rotor core is laminated.

(e) constant magnitude of flux linking the rotor core.

Answer: (a) very low frequency of emf induced in the rotor.

101. Rotor input of a three phase induction motor is equal to

(a) input to motor — stator copper and iron losses.

(b) mechanical power developed — windage and friction losses.

(c) input to motor — windage and friction losses.

(d) input to motor — stator iron losses — windage and friction losses.

Answer: (a) input to motor — stator copper and iron losses.

102. In an induction motor, what is the ratio of rotor copper loss and rotor input ?

(a) 1/s

(b) s

(c) (1 — s)

(d) s/(1 — s) [U.P.S.C. I.E.S. 2007]

Answer: (b) s

103. For an induction motor, operating at slip s, the ratio of gross power output to air gap power is equal to

(a) $(1 — s)^2$

(b) (1 — s)

(c) √(1 — s)

(d) (1 — √s) [GATE E.E. 2005]

Answer: (b) (1 — s)

104. The synchronous watt is

(a) the torque which under synchronous speed would develop a power of 1 watt or power input to rotor in watts.

(b) shaft output in watts.

(c) input power to stator.

(d) the unit of ratings of synchronous machines.

Answer: (a) the torque which under synchronous speed would develop a power of 1 watt or power input to rotor in watts.

105. The no-load current in an induction motor is ……. in comparison to that of a power transformer.

(a) much lower

(b) much higher

(c) slightly less

(d) slightly more

Answer: (b) much higher

106. The equivalent circuit per phase of a three phase transformer is similar to that of a three phase induction motor but the transformer does not develop any torque. This is due to

(a) insufficient voltage.

(b) low supply frequency.

(c) non-fulfillment of condition of space condition of winding.

(d) none of the above.

Answer: (c) non-fulfillment of condition of space condition of winding.

107. In a 3-phase induction motor the variable mechanical load is represented electrically by a variable …….. only.

(a) inductance

(b) capacitance

(c) resistance

(d) any of these

Answer: (c) resistance

108. The stator referred resistance in the equivalent circuit of an induction motor, representing mechanical output is

(a) r_2/s

(b) $r'_2(1/s - 1)$

(c) r_2/s

(d) $r_2^2(1/s - 1)$ [A.M.I.E. Sec B. Electrical. Machines 1994]

Answer: (b) $r'_2(1/s - 1)$

109. If the load on an induction motor is increased from no load to full load, its slip and the power factor will, respectively:

(a) decrease, decrease.

(b) decrease, increase.

(c) increase, decrease.

(d) increase, increase. [U.P.S.C. I.E.S. E.E.-II, 2006]

Answer: (d) increase, increase.

110. The output power of a 3-phase induction motor will be maximum when the equivalent load resistance is equal to the standstill leakage ……. of the motor.

(a) impedance, Z_1'

(b) reactance, X_1'

(c) resistance

(d) capacitance

Answer: (a) impedance, Z_1'

111. The power factor of an induction motor operating at no load will have a value around

(a) 0.9 lag.

(b) 0.2 lead.

(c) 0.2 lag.

(d) 0.9 lead. [I.E.S. E.E.-II, 2010]

Answer: (c) 0.2 lag.

112. The power factor of an induction motor at full load is likely to be

(a) unity.

(b) 0.85 lead.

(c) 0.85 lag.

(d) 0.5 lag.

Answer: (c) 0.85 lag.

113. The power factor of a 3-phase induction motor is likely to be maximum when it will operate at

(a) full load.

(b) no-load.

(c) maximum slip.

(d) maximum torque.

Answer: (a) full load.

114. The power factor of a lightly loaded induction motor is quite low because

(a) the current drawn is largely a magnetizing current due to air gap.

(b) of the current due to air gap.

(c) the current drawn is largely a magnetizing component due to laminated core.

(d) the current drawn is largely an energy component due to laminated core.

Answer: (a) the current drawn is largely a magnetizing current due to air gap.

115. In a 3-phase induction motor when the load is increased from light load

(a) rotor pf increases but stator pf decreases.

(b) stator pf increases but the rotor pf decreases.

(c) both stator and rotor pf increase.

(d) both stator and rotor pf decrease.

Answer: (b) stator pf increases but the rotor pf decreases.

116. An induction motor always operates on lagging power factor. This is due to

(a) stator reactance.

(b) rotor leakage reactance.

(c) the large reactive lagging magnetizing current essential to produce the magnetic flux.

(d) all of the above.

Answer: (d) all of the above.

117. In which of the following tests to be conducted on induction motors, reduced voltage is applied.

(a) Blocked rotor test.

(b) No-load test.

(c) Both (a) and (b).

(d) None of these.

Answer: (a) Blocked rotor test.

118. Blocked rotor test of an induction motor corresponds, in case of a transformer, to

(a) full load.

(b) half-full load.

(c) no load.

(d) short-circuit operation. [A.M.I.E. Elec. Science Summer 1994]

Answer: (d) short-circuit operation.

119. No-load test on a 3-phase induction motor was conducted at different supply voltages and a plot of input power versus voltage was drawn. This curve was extrapolated to intersect the y-axis. This intersection point yields

(a) core loss.

(c) stray load loss.

(b) stator copper loss.

(d) friction and windage loss. [GATE E.E. 2003]

Answer: (d) friction and windage loss.

120. What is the shunt resistance component in equivalent circuit obtained by no-load test of an induction motor representative of?

(a) Windage and frictional losses only.

(b) Core losses only.

(c) Core, windage and frictional losses.

(d) Copper losses. [I.E.S. E.E.-11, 2005; GATE E.E. 2003]

Answer: (b) Core losses only.

121. Under no-load condition, if the applied voltage to an induction motor is reduced from the rated voltage to half the rated value.

(a) the speed decreases and the stator current increases.

(b) both the speed and the stator current decrease.

(c) the speed and the stator current remain practically constant.

(d) there is negligible change in the speed but the stator current decreases. [GATE E.E. 2005]

Answer: (b) both the speed and the stator current decrease.

122. The core losses, and friction and windage losses in case of an induction motor are determined from the ……. test.

(a) no-load

(b) blocked rotor

(c) load

(d) stator resistance

Answer: (a) no-load

123. Short-circuit test is performed on an induction motor to determine

(a) short-circuit current under rated voltage.

(b) equivalent resistance and reactance.

(c) transformation ratio.

(d) power factor on short-circuit.

(e) all of the above.

Answer: (e) all of the above.

124. Circle diagram is employed to determine the performance of a/an

(a) synchronous motor.

(b) induction motor.

(c) dc motor.

(d) transformer.

Answer: (b) induction motor.

125. The power scale of circle diagram of an induction motor is determined from ……. test data only.

(a) open circuit

(b) stator resistance

(c) short circuit

(d) slip

Answer: (c) short circuit

126. In the circle diagram of an induction motor the diameter of the circle represents the

(a) rotor current.

(b) line voltage.

(c) operating torque.

(d) maximum torque.

Answer: (a) rotor current.

127. Circle diagram of an induction motor can be used to determine its

(a) power factor.

(b) efficiency.

(c) output.

(d) slip.

(e) all of the above.

Answer: (e) all of the above.

128. Which one of the following is correct statement?

The output line in an induction motor circle diagram is the line joining the tip of the

(a) no load current phasor to the point corresponding to slip = 0.

(b) no load current phasor to the point corresponding to slip 1.

(c) short circuit current phasor to the point corresponding to slip = 1.

(d) short circuit current phasor to the point corresponding to slip = 0. [I.E.S. E.E.- II, 2007]

Answer: (b) no load current phasor to the point corresponding to slip 1.

129. If the rotor power factor of a 3-phase, induction motor is 0.866, the spatial displacement between the stator magnetic field and the rotor magnetic field will be

(a) 30°

(b) 90°

(c) 120°

(d) 150° [U.P.S.C. I.E.S. E.E.-II, 2000]

Answer: (c) 120°

130. A 3-phase induction motor when started picks up speed but runs stably at about half the normal speed. This is because of

(a) unbalance in the supply voltages.

(b) non-sinusoidal nature of the supply voltage.

(c) stator circuit asymmetry.

(d) rotor circuit asymmetry. [U.P.S.C. I.E.S. E.E.- II, 1998]

Answer: (b) non-sinusoidal nature of the supply voltage.

131. An induction motor is said to be crawling when

(a) it runs at one-seventh of rated speed.

(b) it accelerates too fast.

(c) it is subjected to fluctuating loads.

(d) it is started on full load.

Answer: (a) it runs at one-seventh of rated speed.

132. Zero sequence impedance of a 3-phase cage induction motor is due to

(a) stator circuit 3^{rd} time harmonic.

(b) stator circuit 3^{rd} space harmonic.

(c) rotor circuit 3^{rd} time harmonic.

(d) rotor circuit 3^{rd} space harmonic. [U.P.S.C. I.E.S. E.E.-II, 1998]

Answer: (b) stator circuit 3^{rd} space harmonic.

133. The stator of a 6-pole, 3-phase induction motor is fed from a 3-phase 50 Hz supply which contains a pronounced fifth time harmonic. The speed of the fifth space harmonic field produced by the fifth time harmonic in the stator supply will be

(a) 200 rpm.

(b) 1.500 rpm.

(c) 1,000 rpm.

(d) 5,000 rpm.

Answer: (d) 5,000 rpm.

134. The synchronous speed for the seventh space harmonic mmf wave of a 3-phase, 8-pole, 50 Hz induction machine is

(a) 107.14 rpm in forward direction.

(h) 107.14 rpm in reverse direction.

(c) 5,250 rpm in forward direction.

(a) 5,250 rpm in reverse direction. [GATE E.E. 2004]

Answer: (a) 107.14 rpm in forward direction.

135. An induction motor when started on load does not accelerate up to full speed but runs at $1/7^{th}$ of the rated speed. The motor is said to be

(a) locking.

(b) plugging.

(c) crawling.

(d) cogging. [U.P.S.C. I.E.S. E.E.-II, 2001]

Answer: (c) crawling.

136. The presence of a dominant 7th harmonic in the winding distribution of a 3-phase, 6-pole, 50 Hz induction motor may cause the motor to crawl at a speed of about

(a) 750 rpm.

(b) 500 rpm.

(c) 242 rpm.

(d) 143 rpm. [U.P.S.C. I.E.S. E.E.-II, 1993]

Answer: (d) 143 rpm.

137. Crawling in an induction motor is due to

(a) time harmonics in supply.

(b) slip ring rotor.

(c) space harmonics produced by winding currents.

(d) insufficient starting torque. [U.P.S.C. I.E.S. E.E.-II, 1999]

Answer: (c) space harmonics produced by winding currents.

138. The crawling in the induction motor is caused by

(a) improper design of stator laminations.

(b) low voltage supply.

(c) high loads.

(d) harmonics developed in motor. [U.P.S.C. I.E.S. 2003]

Answer: (d) harmonics developed in motor.

139. The phenomenon of crawling in a 3-phase induction motor may be due to

(a) unbalanced supply voltage.

(b) 7th space harmonics of air-gap field.

(c) 7th time harmonies of voltage wave.

(d) 5th space harmonics. [U.P.S.C. I.E.S. E.E.-II, 1998]

Answer: (b) 7th space harmonics of air-gap field.

140. In an induction motor, when the number of stator slots is equal to an integral multiple of rotor slots,

(a) there may be a discontinuity in torque-slip characteristics.

(b) a high starting torque will be available.

(c) the maximum torque will be high.

(d) the machine will fail to start. [U.P.S.C. I.E.S. E.E.-II, 2003]

Answer: (d) the machine will fail to start.

141. Crawling of induction motor occurs due to

(a) harmonic synchronous torques.

(b) harmonic induction torques.

(c) vibration torques.

(d) both (a) and (b).

Answer: (d) both (a) and (b).

142. Presence of 5th harmonics in induction motor causes

(a) cogging.

(b) crawling.

(c) small reverse braking torque.

(d) hunting.

Answer: (c) small reverse braking torque.

143. The cogging occurs in induction motors due to

(a) harmonic induction torques.

(b) harmonic synchronous torques.

(c) vibration torques.

(d) both (a) and (b).

Answer: (b) harmonic synchronous torques.

144. Cogging of induction motors occurs at

(a) high voltage and when the number of stator teeth and rotor teeth are equal.

(b) high voltage and when the number of stator teeth and rotor teeth are not equal.

(c) low voltage and when the number of stator teeth and rotor teeth are equal.

(d) low voltage and when the number of stator teeth and rotor teeth are not equal.

Answer: (c) low voltage and when the number of stator teeth and rotor teeth are equal.

145. Cogging and crawling are phenomenon associated with

(a) cage induction machines and they are essentially the same.

(b) squirrel cage induction machines, the former during starting and the latter at a fraction of its rated speed.

(c) squirrel cage induction machines the former at a fraction of its rated speed and the latter during starting.

(d) wound rotor induction machines and they are reduced by skewing, chording and distribution of windings. [U.P.S.C. I.E.S. E.E.-11, 1995]

Answer: (b) squirrel cage induction machines, the former during starting and the latter at a fraction of its rated speed.

146. In an induction motor, if the air gap is increased

(a) speed will reduce.

(b) efficiency will improve.

(c) power factor will be lowered.

(d) breakdown torque will reduce. [GATE E.E. 1996]

Answer: (c) power factor will be lowered.

147. If two induction motors A and B are identical except that the air-gap of motor 'A' is 50% greater than that of motor 'B' then

(a) the no-load power factor of **A** will be better than that of **B**.

(b) the no-load power factor of **A** will be poorer than that of **B**.

(c) the core losses of **A** will be more than those of **B**.

(d) the operating flux of **A** will be smaller than that of **B**. [U.P.S.C. I.E.S. E.E.-II, 1997]

Answer: (b) the no-load power factor of A will be poorer than that of B.

148. An increase in number of poles of an induction motor results in

(a) decrease in maximum pf.

(b) increase in maximum pf.

(c) no change in maximum pf.

(d) cannot be predicted. [A.M.I.E. Sec B. Principles of Elec. Design Winter 1993]

Answer: (a) decrease in maximum pf.

149. Increase in length of air gap in an induction motor causes

(a) decrease in power factor.

(b) decrease in pulsation losses.

(c) increase in ampere-turns required to produce same flux density in the air gap.

(d) all of the above.

Answer: (d) all of the above.

150. An induction motor with larger number of slots has overload capacity.

(a) low

(b) large

(c) no effect on

(d) none of these.

Answer: (b) large

151. The 3-phase induction motor provided with open slots has

(a) reduced leakage reactance.

(b) increased starting current, starting torque and breakdown torque.

(c) better pf.

(d) improved efficiency.

(e) both (a) and (b).

Answer: (e) both (a) and (b).

152. Semi-closed or totally closed slots are used in induction motors essentially to

(a) improve pull-out torque.

(b) increase pull-out torque.

(c) increase efficiency.

(d) reduce magnetizing current and improve power factor. [U.P.S.C. I.E.S. E.E.-II, 1994]

Answer: (d) reduce magnetizing current and improve power factor. [U.P.S.C. I.E.S. E.E.-II, 1994]

153. The stator of a small (up to 5 hp) induction motor is provided with

(a) open slots with parallel teeth.

(b) open slots with tapered teeth.

(c) semi-closed slots with parallel teeth.

(d) totally closed slots with parallel teeth.

Answer: (c) semi-closed slots with parallel teeth.

154. "Cogging" in induction motor occurs when

(a) number of stator teeth — number of rotor teeth = odd number.

(b) number of stator teeth — number of rotor teeth = even number.

(c) number of stator teeth — number of rotor teeth = zero.

(d) number of stator teeth — number of rotor teeth = negative number.

Answer: (c) number of stator teeth — number of rotor teeth = zero.

155. To avoid cogging in a squirrel cage induction motor the following stator slot (Z_1) and rotor slot (Z_2) combination must be avoided

(a) $Z_1 = Z_2$

(b) $Z_1 - Z_2 = 2P + 1$

(c) $Z_1 - Z_2 = 3P + 1$

(d) $Z_1 - Z_2 = 3P - 1$ [A.M.LE. Sec B. Elec. Machine Design Summer 1997]

Answer: (a) $Z_1 = Z_2$

156. In a 3-phase induction motor, the stator slots are

(a) equal to rotor slots.

(b) exact multiple of rotor slots.

(c) not exact multiple of rotor slots.

(d) none of the above.

Answer: (c) not exact multiple of rotor slots.

157. In a 3-phase induction motor, the number of slots on stator is not kept an exact multiple of the number of rotor slots because it

(a) facilitates cooling.

(b) avoids magnetic locking between stator field and rotor.

(c) improves efficiency.

(d) improves pf.

Answer: (b) avoids magnetic locking between stator field and rotor.

158. The difference between the number of stator slots and that of rotor slots in an induction motor should not be equal to P, 2P or 5P. It is essential in order to avoid

(a) synchronous cusps.

(b) crawling.

(c) magnetic locking.

(d) noise and vibrations.

Answer: (a) synchronous cusps.

159. In induction machines, it is usually a standard practice to employ

(a) integral-slot winding with full pitch coils.

(b) integral slots winding with chorded coils.

(c) fractional slot winding with fractional pitch coils.

(d) fractional slot winding with full pitch coils.

Answer: (b) integral slots winding with chorded coils.

160. The rotor slots in a 3-phase induction motor are kept inclined. This phenomenon is known as

(a) skewing.

(b) crawling.

(c) cogging.

(d) none of these.

Answer: (a) skewing.

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

(a) eddy currents and copper requirement.

(b) noise, vibrations and synchronous cusps.

(c) both (a) and (b).

(d) none of these.

Answer: (b) noise, vibrations and synchronous cusps.

162. Skew of rotor bar eliminates

(a) the effect of space harmonics.

(b) the entire effect of crawling.

(c) magnetic noise.

(d) vibration due to unequal force developed on rotor.

Answer: (a) the effect of space harmonics.

163. Which of the following statements regarding skewing of rotor bars in a squirrel cage induction motor are correct

1. It prevents cogging.

2. It produces more uniform torque.

3. It increases starting torque.

4. It reduces motor 'hum' during its operation.

Select the answer using the codes given below:

(a) 2, 3, 4.

(b) 1, 2, 3.

(c) 1, 3, 4.

(d) 1, 2, 4.

Answer: (c) 1, 3, 4.

164. Jogging of an induction motor is

(a) energizing a motor once or repeatdly to have small movements for mechanisms.

(b) a process of synchronisation.

(c) a method of braking.

(d) none of the above.

Answer: (a) energizing a motor once or repeatdly to have small movements for mechanisms.

165. In 3-phase induction motors, sometimes copper bars are placed deep in the rotor. It is done in order to improve

(a) efficiency.

(b) starting torque.

(c) power factor.

(d) none of these.

Answer: (b) starting torque.

166. In a squirrel cage induction motor high starting torque is achieved by using (a) high resistance in series with the rotor circuit.

(b) low resistance across the rotor circuit.

(c) double cage rotor.

(d) none of these.

Answer: (c) double cage rotor.

167. The outer cage of a double squirrel rotor consists of

(a) manganese brass.

(b) red copper.

(c) bronze.

(d) steel.

Answer: (a) manganese brass.

168. In double cage induction motor the inner cage has

(a) high resistance and high leakage reactance.

(b) high resistance and low leakage reactance.

(c) low resistance and high leakage reactance.

(d) low resistance and low leakage reactance.

Answer: (c) low resistance and high leakage reactance.

169. In the rotor equivalent circuit of a double-cage induction motor, the two rotor cages can be considered

(a) to be in parallel.

(b) to be in se series-parallel.

(c) to be in series.

(d) to be in parallel with stator.

Answer: (a) to be in parallel.

170. The advantage of the double squirrel-cage induction motor over single cage rotor is that its

(a) efficiency is higher.

(b) power factor is higher.

(c) slip is larger.

(d) starting current is lower. [I.E.S. E.E.-11. 2001]

Answer: (d) starting current is lower.

171. In a double squirrel cage induction motor, the resistance of upper cage is ……. that of inner cage.

(a) equal to

(b) 4 to 5 times of

(c) one-fourth of

(d) none of these.

Answer: (b) 4 to 5 times of

172. Motor A has-shallow and wider slots. Motor B has deeper and narrow slots. If both are 3-phase 400 V, 50 Hz, 1440 rpm induction motors. It can be concluded that

(a) Motor **A** has more starting torque as compared to motor **B**.

(b) Motor **B** has more starting torque as compare to motor **A**.

(c) Motor **A** has more pull-out torque as compared to motor **B**.

(d) Motor **B** has more pull-out torque as compared to motor **A**. [I.E.S. E.E.-II, 1992]

Answer: (b) Motor B has more starting torque as compare to motor A.

173. The deep-bar rotors or double cage rotors are employed to

(a) increase starting torque.

(b) improve efficiency.

(c) increase pull-out torque.

(d) reduce rotor core loss.

Answer: (a) increase starting torque.

174. During starting of a double cage induction motor, the current induced in the rotor

(a) flows mostly through the lower cage.

(b) flows mostly through the upper cage.

(c) is equally divided between the two windings.

(d) none of the above.

Answer: (b) flows mostly through the upper cage.

175. Squirrel cage induction motors have the advantages of

(a) cheaper in initial as well as in maintenance costs.

(b) nearly constant speed, high overload capacity, simple starting arrangement and high power factor.

(c) lower copper losses and higher operation efficiency.

(d) all of the above.

Answer: (d) all of the above.

176. Squirrel cage induction motors have the disadvantages of

(a) higher starting current and poor starting torque.

(b) high sensitivity to fluctuations in supply voltage and low power factor at light-load.

(c) no possibility of speed regulation.

(d) all of the above.

Answer: (d) all of the above.

177. Slip-ring induction motors have the advantages of

(a) high starting torque and high overload capacity.

(b) nearly constant speed.

(c) low starting current in comparison to squirrel cage induction motor.

(d) all of the above.

Answer: (d) all of the above.

178. Slip-ring motors have the disadvantages of

(a) low efficiency and low power factor in comparison to squirrel cage induction motors.

(b) low power factor at light load.

(c) sensitivity to fluctuations in supply voltage.

(d) all of the above.

Answer: (d) all of the above.

179. For high starting torque, the most suitable 3-phase induction motor is …….. induction motor.

(a) slip-ring

(b) squirrel cage

(c) double cage

(d) deep bar squirrel cage

Answer: (a) slip-ring

180. Which of the following ac motor is widely used ?

(a) Squirrel cage induction motor.

(b) Slip-ring induction motor.

(c) Double cage induction motor.

(d) Synchronous motor.

Answer: (a) Squirrel cage induction motor.

181. A squirrel cage induction motor is not favoured when ……. is the main consideration.

(a) initial cost

(b) maintenance cost

(c) high starting torque

(d) higher efficiency and higher power factor

Answer: (c) high starting torque

182. A slip-ring induction motor is recommended for applications requiring

(a) high starting torque.

(b) variable speed operation.

(c) frequent starting stopping and reversing operations.

(d) all of the above features.

Answer: (d) all of the above features.

183. Induction motors, over synchronous motors, have the advantages of

(a) being self starting.

(b) having no requirement for dc excitation.

(c) possibility of speed control to small extent.

(d) simplicity and lower cost.

(e) all of the above.

Answer: (e) all of the above.

184. Unbalanced 3-phase voltage supply to an induction motor causes excessive heating of

(a) rotor.

(b) stator.

(c) rotor shaft.

(d) none of these.

Answer: (a) rotor.

185. Unbalanced supply voltage given to a 3-phase, delta-connected induction motor will cause

(a) zero sequence currents.

(b) less heating of motor.

(c) negative sequence component current.

(d) all the above. [GATE E.E. 1996]

Answer: (c) negative sequence component current.

186. Single phase preventer

(a) suppresses negative sequence currents.

(b) compensates for voltage drops.

(c) provides protection in the event of non-availability of one of the phases.

(d) none of the above.

Answer: (c) provides protection in the event of non-availability of one of the phases.

187. An induction motor is fed from a balanced three phase supply at rated voltage and frequency through a bank of three single phase transformers connected in delta-delta. One unit of the bank develops fault and is removed. Then

(a) single phasing will occur and the machine fails to start.

(b) single phasing will not occur but the motor terminal voltages will become unbalanced and the machine can be loaded to the extent of 57.7% of its rating.

(c) the machine can be loaded to the extent of 57.7% of its rating with balanced supply at its terminals.

(d) the machine can be loaded to the extent of 66% of its rating with balanced supply at its terminals. [GATE E.E. 1995]

Answer: (a) single phasing will occur and the machine fails to start.

188. If a 3-phase induction motor is started when one of the phases is not available, then the motor

(a) will hum but not start.

(b) will continue to operate satisfactorily on loaa below 57.7% of rated load if brought up to speed by some external means.

(c) will operate under reduced load but usually with considerable vibrations in case of wound rotor motor is brought up to speed by some external means.

(d) start and operate at a lower speed.

(e) all of the above except (d).

Answer: (e) all of the above except (d).

189. If one of the 3-phases of supply to an induction motor fails, may be due to any reason, when the motor is running normally, the motor will

(a) continue running at the same speed if it was running on light load.

(b) continue running but will draw more current if it was operating at rated load. (c) stop and carry heavy current causing permanent damage to the windings if it was operating overloaded.

(d) all of the above.

Answer: (d) all of the above.

190. Consider the following statements: In a 3-phase induction motor connected to a 3-phase supply; if one of the lines suddenly gets disconnected, then the

1. motor will come to a standstill.

2. motor will continue to run at the same speed with line current unchanged.

3. motor will continue to run at a slightly reduced speed with increase in line current.

4. rotor current will have both of **sf** and **(2—s)f** component frequencies where **s** is the slip and **f** is the supply fre-quency. Of these statements

(a) 1 and 4 are correct.

(b) 1 and 2 are correct.

(c) 3 and 4 are correct.

(d) 2 and 3 are correct. [I.E.S. EE.-II, 1995]

Answer: (c) 3 and 4 are correct.

191. Increase in supply voltage to a 3-phase induction motor will not cause

(a) decrease in input current and so reduction in copper losses.

(b) increase in torque.

(c) decrease in speed as well as in core loss.

(d) operating temperature abnormally higher owing to increase in core loss.

Answer: (c) decrease in speed as well as in core loss.

192. Decrease in supply voltage to a 3 phase induction motor will not cause

(a) any difficulty in accelerating the load.

(b) increase in torque.

(c) decrease in speed as well as in core loss.

(d) increase in stator as well as rotor currents.

(e) operating temperature abnormally high owing to increase in copper loss.

Answer: (b) increase in torque.

193. A 3-phase induction motor is operating at its rated torque. If the supply voltage falls to 75% of its normal value,

(a) the motor will get heated up to inadmissible extent after some time.

(b) the motor will stop.

(c) the slip will decrease.

(d) the stator and rotor current will decrease.

Answer: (a) the motor will get heated up to inadmissible extent after some time.

194. A squirrel cage induction motor having a rated slip of 4% of full-load has a starting torque same as the full-load torque. Which one of the following statements is correct? The starting current is

(a) equal to the full-load current.

(b) twice the full-load current.

(c) four times the full-load current.

(d) five times the full-load current.

Answer: (d) five times the full-load current.

195. An induction motor having full-load torque of 60 Nm when delta connected develops a starting torque of 120 Nm. For the same supply voltage, if the motor is changed to star-connection, the starting torque developed will be

(a) 40 Nm

(b) 60 Nm

(c) 90 Nm

(d) 120 Nm [GATE E.E. 1996]

Answer: (a) 40 Nm

196. A 3-phase, 480 V, 60 Hz induction motor is to be operated at 50 Hz supply. The most satisfactory supply voltage for the machine would be

(a) 480 V

(b) 400 V

(c) 600 V

(d) 440 V

Answer: (b) 400 V

197. If a 3-phase 350 V, 50 Hz, 1440 rpm induction motor is operated on 420 V, 60 Hz supply, then the torque will

(a) increase.

(b) decrease.

(c) remain unchanged.

(d) none of these.

Answer: (c) remain unchanged.

198. The starting torque of an induction motor varies as

(a) f

(b) $1/f^2$

(c) 1/f

(d) f^2

Answer: (b) $1/f^2$

199. With the increase in supply frequency …….. decrease(s).

(a) starting current

(b) starting torque

(c) full load current

(d) maximum running torque

(e) starting and full load currents and starting and maximum running torque

Answer: (e) starting and full load currents and starting and maximum running torque

200. This size of a high speed motor is in comparison to that of a low speed motor for the same kW output.

(a) smaller

(b) larger

(c) almost the same

(d) unpredictable

Answer: (a) smaller

201. Which of the following induction motors will operate on the lowest value of power factor?

(a) 7.5 kW, 950 rpm.

(b) 7.5 kW, 1440 rpm.

(c) 15 kW, 950 rpm.

(d) 15 kW, 1440 rpm.

Answer: (a) 7.5 kW, 950 rpm.

202. For starting a 3-phase induction motor ……. winding is to be connected to 3-phase ac supply.

(a) rotor

(b) stator

(c) both stator and rotor

(d) none

Answer: (b) stator

203. The starting current of a 3-phase induction motor is about ……. of its full-load rated current.

(a) half

(b) twice

(c) 5 to 7 times

(d) 15 to 20 times

Answer: (c) 5 to 7 times

204. The following starting method for an induction motor is inferior from the point of view of poor starting torque per ampere of the line current drawn

(a) Direct-on-line starting.

(b) Auto transformer method of starting.

(c) Series inductor method of starting.

(d) Star-delta method of stating. [GATE E.E. 1999]

Answer: (c) Series inductor method of starting.

205. Direct-on-line starter can be used for small capacity ……. induction motors.

(a) squirrel cage

(b) wound rotor

(c) squirrel cage and wound rotor both types of

Answer: (c) squirrel cage and wound rotor both types of

206. For starting a small induction motor DOL starter is used in place of iron clad triple-pole (ICTP) switch as it

(a) provides protection against overload and undervolt.

(b) reduces the starting current.

(c) increases the starting torque.

(d) improves the power factor and efficiency.

Answer: (a) provides protection against overload and undervolt.

207. Induction motors, when directly switched on across their normal rated supply voltage, the torque developed at starting is about …….. of their full load torque.

(a) half

(b) 1.5 to 2.5 times

(c) 5 times

(d) 10 times

Answer: (b) 1.5 to 2.5 times

208 …….. starter is used for starting a 3-phase induction motor that needs frequent starting and operating in forward and reverse directions.

(a) Direct-on-line

(b) Star-delta

(c) Auto-transformer

(d) Reduced voltage

Answer: (a) Direct-on-line

209. A squirrel cage induction motor having a rated slip of 2% on full-load has a starting torque of 50% of full-load torque. The starting current is

(a) two times the full-load current.

(b) four times the full-load current.

(c) five times the full-load current.

(d) equal to the full-load current. [I.E.S. E.E.-II, 2010]

Answer: (c) five times the full-load current.

210. With DOL start of an induction motor the heating during acceleration of inertia load is proportional to

(a) slip at maximum torque.

(b) maximum torque.

(c) stored kinetic energy.

(d) electromagnetic power developed on the rotor. [A.M.I.E. Sec B. Winter 1996]

Answer: (d) electromagnetic power developed on the rotor.

211. Primary series resistors are employed in the stator for starting a 3-phase squirrel cage induction motor to

(a) increase the starting torque.

(b) improve the pf and efficiency of the motor.

(c) reduce voltage applied across the motor terminals.

(d) increase the motor speed.

Answer: (c) reduce voltage applied across the motor terminals.

212. For starting 3-phase squirrel cage induction motors reactors are preferred over resistors as the reactors

(a) incur less power loss and effectively reduce the applied volt-age to the motor. (b) increase the starting torque.

(c) improve the power factor at start.

(d) all of the above.

Answer: (a) incur less power loss and effectively reduce the applied volt-age to the motor.

213. If the applied voltage across a 3-phase induction motor is reduced to x times, the starting current and starting torque will be reduced to …… and …… times respectively.

(a) x, x

(b) x, x^2

(c) x^2, x

(d) x^2, x^2

Answer: (b) x, x^2

214. A 3-phase squirrel-cage induction motor is started by means of a star/delta switch. What is the starting current of the motor?

(a) 3 times the current with direct on line starting.

(b) 1/3 times the current with direct on line starting.

(c) 1/ √3 times the current with direct on line starting.

(d) √3 times the current with direct on line starting. [I.E.S. E.E.-11, 2008]

Answer: (b) 1/3 times the current with direct on line starting.

215. The starting current and torque of three phase induction motor on direct line starting is 30 Amp and 300 Nm, respectively. What are the corresponding values with star-delta starter?

(a) 10 A and 100 Nm.

(b) 30 A and 300 Nm.

(c) 17.32 A and 173.2 Nm.

(d) 30 A and 173.3 Nm. [U.PS.C. IES. 2009]

Answer: (a) 10 A and 100 Nm.

216. In auto-transformer starting of a 3-phase induction motor, if the tapping used is x then the starting line current and starting torque will be …… and …… times respectively with direct-on-line starting.

(a) x, x

(b) x, x^2

(c) x^2, x^2

(d) x^2, x

Answer: (c) x^2, x^2

217. A starting torque of 80 Nm is developed in an induction motor by an auto-transformer starter with a tapping of 30%. If the tapping of auto transformer starter is 60%, then what is the starting torque?

(a) 40 Nm.

(b) 160 Nm.

(c) 240 Nm.

(d) 320 Nm. [U.P.S.C. I.E.S. 2005]

Answer: (d) 320 Nm.

218. For the purpose of starting an induction motor, star/delta starter is an equivalent to an auto-transformer of ratio

(a) 33.3%

(b) 57.7%

(c) 73.2%

(d) 100% [I.E.S. E.E.-II 2002]

Answer: (b) 57.7%

219. Consider the following statements: Star-delta starter is used in 3-phase induction motor because it

1. prevents heating of the motor windings.

2. ensures permissible minimum starting current.

3. is regulated by electricity authorities.

4. ensures smooth run-up to full load.

Of these statements.

(a) 1, 2 and 3 are correct.

(b) 2, 3 and 4 are correct.

(c) 1, 3 and 4 are correct.

(d) 1 and 2 are correct. [I.E.S. 1998]

Answer: (a) 1, 2 and 3 are correct.

220. For slip-ring induction motors, rotor resistance starting is preferred over reduced voltage starting because it

(a) limits the speed.

(b) limits the starting current.

(c) increases the starting torque.

(d) improves the starting power factor.

(e) limits starting current, increases starting torque and also improves starting power factor.

Answer: (e) limits starting current, increases starting torque and also improves starting power factor.

221. In case of 3-phase slip-ring induction motor, as the rotor resistance is increased, the starting torque

(a) increases.

(b) decreases.

(c) increases upto a certain value of resistance and then remains constant.

(d) increases upto a certain value of resistance and then decreases. [A.M.I.E. Sec B. Winter 1995]

Answer: (d) increases upto a certain value of resistance and then decreases.

222. A 3-phase slip-ring induction motor having negligible stator impedance drives a constant torque load. If an additional resistance is included in the rotor circuit, what does the motor experience?

(a) Increase in both the stator current and the slip.

(b) No change in the stator current and increase in the slip.

(c) Increase in the stator current and no change in the slip.

(d) Decrease in the stator current and increase in the slip. [I.E.S. E.E.-II, 2008]

Answer: (d) Decrease in the stator current and increase in the slip.

223. An induction motor can run at synchronous speed if it is operated

(a) on no-load.

(b) on full load.

(c) with emf injected in the rotor circuit.

(d) on voltage higher than the rated voltage.

Answer: (c) with emf injected in the rotor circuit.

224. The speed regulation of a 3-phase induction motor at full load is about

(a) 4%

(b) 8%

(c) 15%

(d) 25%

Answer: (a) 4%

225. The speed of an induction motor depends on

(a) number of stator poles.

(b) stator supply frequency.

(c) input voltage to stator.

(d) all of the above.

Answer: (d) all of the above.

226. Smooth speed control can be achieved by

(a) rotor resistance control only.

(b) rotor slip power control only.

(c) variation of supply frequency only.

(d) both rotor slip power control and variation of supply frequency.

Answer: (d) both rotor slip power control and variation of supply frequency.

227. The speed of a slip-ring three phase induction motor can be controlled from the rotor side by

(a) changing the supply voltage.

(b) changing the supply frequency.

(c) rheostatic control.

(d) changing the number of poles. [IES. E.E.II, 2008]

Answer: (c) rheostatic control.

228. Which of the following methods are suitable for the speed control of squirrel cage induction motors?

1. Voltage control.

2. Rotor resistance control.

3. Frequency control.

4. Pole changing method.

Select the correct answer using the codes given below:

(a) 2, 3 and 4.

(b) 1, 3 and 4.

(c) 1, 2 and 3.

(d) 2 and 4. [I.E.S. E.E.-II, 2005]

Answer: (b) 1, 3 and 4.

229. A 3-phase induction motor fed from a 3-phase voltage regulator is suitable for driving loads whose torque is

(a) constant irrespective of speed.

(b) inversely proportional to the square of the speed.

(c) directly proportional to the square of the speed.

(d) inversely proportional to speed.

Answer: (c) directly proportional to the square of the speed.

230. Synchronous speed of an induction motor can be increased by

(a) reducing mechanical friction.

(b) increasing supply voltage.

(c) increasing number of poles.

(d) increasing supply frequency. [A.M.I.E. Winter 1997]

Answer: (d) increasing supply frequency.

231. In a variable speed induction motor drive V/f, is kept constant over a wide range of its frequency variation. The motor operates in the following mode :

(a) constant power mode.

(b) constant torque mode.

(c) variable power and variable torque mode.

(d) constant slip mode. [A.M.I.E. Sec B. Summer 1993]

Answer: (b) constant torque mode.

232. In ac motor control V/f is kept constant to

(a) make maximum use of the magnetic circuit.

(b) make minimum use of the magnetic circuit.

(c) maximize the current drawn.

(d) make the power constant. [A.M.I.E. Sec B. Summer 1994]

Answer: (a) make maximum use of the magnetic circuit.

233. While operating on variable frequency supplies, the ac motor requires variable voltage as well in order to

(a) protect the insulation.

(b) avoid the effect of saturation.

(c) improve the capabilities of the inverter.

(d) protect the thyristor from dv/dt . [E.E.-II, 1993]

Answer: (b) avoid the effect of saturation.

234. A variable frequency induction motor is operated at constant V/f ratio. It has the following features over wide speed range regarding motor magnetising current (I_m.) and maximum torque (T_m) respectively:

(a) Variable I_m, constant T_m.

(b) Constant I_m, constant T_m.

(c) Constant I_m, variable T_m.

(d) Variable I_m, variable T_m. [A.M.I.E. Sec B. Winter 1998]

Answer: (b) Constant I_m, constant T_m.

235. In a 3-phase induction motor, if supply voltage and frequency are reduced by the same ratio, then slip at which maximum torque occurs is

(a) more and maximum torque T_{em} remains constant.

(b) more and T_{em} decreases.

(c) less and T_{em} decreases.

(d) less and T_{em} increases. [A.M.I.E. Sec B. Summer 2000]

Answer: (a) more and maximum torque T_{em} remains constant.

236. A 3-phase squirrel cage induction motor has a full-load efficiency of 0.8 and a maximum efficiency of 0.9. It is operated at a slip of 0.6 by applying a reduced voltage. The efficiency of the motor at this operating point is

(a) less than 0.4.

(b) greater than 0.6.

(c) in the range of 0.8 ± 0.1.

(d) none of the above. [GATE E.E. 1998]

Answer: (c) in the range of 0.8 ± 0.1.

237. During plugging of an induction motor

(a) phase sequence is reversed.

(b) a dc source is connected to stator.

(c) one phase is open circuited.

(d) power is fed back to mains. [A.M.I.E. Sec B. 2002; 2003]

Answer: (a) phase sequence is reversed.

238. In dynamic braking of 3-phase induction motors

(a) the supply terminals of any two stator phases are interchanged.

(b) any two stator terminals are earthed.

(c) the stator terminals are switched over to a dc source from the ac supply.

(d) a dc voltage is injected in the rotor circuit.

Answer: (c) the stator terminals are switched over to a dc source from the ac supply.

239. In a 3-phase induction motor, the regenerative braking occur when

(a) the load is lowered by a hoisting machine.

(b) the load is raised by a hoisting machine.

(c) the number of poles is reduced in a pole-changing motor.

(d) the motor speed falls due to overload.

Answer: (a) the load is lowered by a hoisting machine.

240. The stator of a 2/4 pole changing cage motor is initially wound for 2-poles. The reconnection of the stator winding to 4-poles through a change over switch, while the motor is running would result in

(a) constant torque drive.

(b) constant hp drive.

(c) plugging to standstill.

(d) regenerative braking to half the original speed. [U.P.S.C. I.E.S. 1992]

Answer: (d) regenerative braking to half the original speed.

241. If a squirrel cage induction motor runs slow, the probable cause could be

(a) low voltage.

(b) overload.

(c) shorted stator coils.

(d) one phase open.

(e) open stator coils.

(f) any of these.

Answer: (f) any of these.

242. If a squirrel cage induction motor run hot, the probable cause could be

(a) uneven air gap.

(b) overload.

(c) low supply frequency.

(d) any of these.

Answer: (d) any of these.

243. If an induction motor hums during starting up, the possible cause could be

(a) open circuit.

(b) unequal phase resistance.

(c) inter-turn short circuit on rotor.

(d) any of the above.

Answer: (d) any of the above.

244. Three phase induction motor should preferably be mounted on

(a) wooden structure.

(b) FVC platform.

(c) solid concrete foundation.

(d) rigid steel structure.

(e) either (c) and (d).

Answer: (e) either (c) and (d).

245. The large sized induction motors are protected against overload by

(a) high-voltage fuses.

(b) automatic cutouts.

(c) thermal or magnetic relays.

(d) rewirable fuses.

Answer: (c) thermal or magnetic relays.

246. The insulating materials employed for motor windings are classified according to

(a) motor kW output rating.

(b) level of temperature rise.

(c) controller size.

(d) overload protection available.

Answer: (b) level of temperature rise.

247. The speed of a slip-ring induction motor cannot be controlled by

(a) rotor resistance control.

(b) pole changing method.

(c) concatenation or cascade operation.

(d) rotor slip power control.

Answer: (b) pole changing method.

248. Consequent pole technique employed for speed control of induction motors involves changing of the

(a) slip.

(b) supply frequency.

(c) number of poles.

(d) any of these.

Answer: (c) number of poles.

249. For the applications requiring speed ratio other than 2 : 1, the speed control can be affected by varying the number of stator poles employing

(a) multiple stator winding.

(b) pole amplitude modulation technique.

(c) consequent pole technique.

(d) any of the above.

Answer: (b) pole amplitude modulation technique.

250. Rotor resistance speed control used for 3-phase slip-ring induction motors has the drawbacks of

(a) reduced starting torque.

(b) lower efficiency and poor speed regulation.

(c) both (a) and (b).

(d) none of these.

Answer: (b) lower efficiency and poor speed regulation.

251. In rotor resistance control method, with the increase in speed.

(a) torque increases

(b) torque decreases

(c) slip increases

(d) losses increase

Answer: (b) torque decreases

252. Consider the following statements regarding speed control of induction motors by means of external rotor resistors :

1. Regulation in speed is accompanied by reduced efficiency.

2. With a large resistance in the rotor circuit, the speed would vary considerably with variation in torque.

3. The method is very complicated. The disadvantages of such a method of speed control would include

(a) 1 and 2.

(b) 2 and 3.

(c) 1 and 3.

(d) 1, 2 and 3. [I.E.S. E.E.-II, 1997]

Answer: (a) 1 and 2.

253. A 3-phase induction motor is driving a constant torque load at rated voltage and frequency. If both voltage and frequency are halved, following statements relate to new condition if stator resistance, leakage reactance and core loss are ignored.

P. The difference between synchronous . speed and actual speed remains the same.

Q. The air gap flux remains same.

R. The stator current remains same.

S. The pu slip remains same.

Among the above, correct statements are

(a) All.

(b) P, Q and R.

(c) Q, R and S.

(d) P and S. [GATE E.E. 2003]

Answer: (b) P, Q and R.

254. The absolute speed of magnetic field in space of a 3-phase rotor fed induction motor is

(a) synchronous speed N_s.

(b) rotor speed N_s.

(c) $(N_s - N_r)$

(d) $(N_s + N_s)$. [I.E.S. E.E.-II, 1996]

Answer: (c) (N_s — N_r)

255. Line voltage control is used only with small squirrel cage motors driving fans and blowers as

(a) it reduces pull-out torque.

(b) the range of speed control is limited.

(c) both (a) and (b).

(d) none of these.

Answer: (c) both (a) and (b).

256. A wound rotor induction motor runs with a slip of 0.03 when developing full-load torque. Its rotor resistance is 0.25 Ω per phase. If an external resistance of 0.5 Ω per phase is connected across slip-rings, what is the slip for full load torque?

(a) 0.03.

(b) 0.06.

(c) 0.09.

(d) 0.1. [U.P.S.C. I.E.S. E.E.-II, 2009]

Answer: (c) 0.09.

257. The injected emf in the rotor of induction motor must have

(a) the same frequency as the stator slip frequency.

(b) the same phase as the rotor emf.

(c) a high value for satisfactory speed control.

(d) the same phase as the rotor emf and a high value for satisfactory speed control. [U.P.S.C. I.E.S. E.E.-II, 2003]

Answer: (a) the same frequency as the stator slip frequency.

258. In rotor resistance control of induction motor, the hardness of speed torque characteristic

(a) increases.

(b) decreases.

(c) remains same. [A.M.I.E. Sec B. Winter 1996]

Answer: (b) decreases.

259. The method that gives continuous speed control of a slip-ring induction motor is

(a) rotor resistance control.

(b) secondary foreign voltage control.

(c) concatenation or cascade operation.

(d) line voltage control.

Answer: (b) secondary foreign voltage control.

260. In case of voltage injection method of speed control, the injected emf should be of

(a) supply frequency (f)

(b) slip frequency (sf)

(c) (1— s) f

(d) (2 — s)f [A.M.I.E. Sec B. Winter 1995]

Answer: (b) slip frequency (sf)

261. When will a slip-ring induction motor run at super synchronous speed?

(a) If a voltage is injected in the rotor circuit in phase opposition to the rotor induced emf.

(b) If an emf is injected in the rotor circuit in phase with the rotor induced mot

(c) If motor is coupled with active load.

(d) If motor is coupled with passive load. [U.P.S.C. I.E.S. 2009]

Answer: (a) If a voltage is injected in the rotor circuit in phase opposition to the rotor induced emf.

262. A voltage source inverter is used to control the speed of a three-phase, 50 Hz, squirrel cage induction motor. Its slip for rated torque is 4%. The flux is maintained at rated value. If the stator resistance and rotational losses are neglected, then the frequency of the impressed voltage to obtain twice the rated torque at starting should be

(a) 10 Hz

(b) 5 Hz

(c) 4 Hz

(d) 2 Hz

Answer: (c) 4 Hz

263. Speeds higher than synchronous speed can be had by

(a) line voltage control.

(b) rotor slip power control.

(c) rotor resistance control.

(d) frequency control.

Answer: (b) rotor slip power control.

264. Slip-changing method of speed control can be used in case of

(a) slip-ring induction motors only.

(b) squirrel cage induction motors only.

(c) squirrel cage as well as slip-ring induction motors.

(d) none of the above.

Answer: (a) slip-ring induction motors only.

265. Cascade method of speed control involves the use of two coupled induction motors. The necessary condition for speed control is that

(a) both the motors are of the wound rotor type having the same number of poles.

(b) both the motors are of the squirrel cage rotor type having different number of poles.

(c) one motor is of the slip-ring type but both the motors have the same number of poles.

(d) one motor is of the slip-ring type and the two motors have different number of poles. [U.P.S.C. I.E.S. E.E.-II, 1993]

Answer: (d) one motor is of the slip-ring type and the two motors have different number of poles.

266. At sub-synchronous speeds, in Kramer system, the electrical power fed to the auxiliary commutator machine at slip frequency is

(a) dissipated as heat.

(b) converted into mechanical power and supplied to the driven shaft.

(c) converted into electrical energy at line frequency and re-turned back to the supply mains.

(d) none of the above.

Answer: (b) converted into mechanical power and supplied to the driven shaft.

267. At sub-synchronous speed, in Scherbius system, the electrical power supplied to the auxiliary commutator machine at the slip frequency is

(a) dissipated as heat.

(b) converted into mechanical power and supplied to the driven shaft.

(c) converted into electrical energy at line frequency and re-turned back to the supply mains.

(d) none of the above.

Answer: (c) converted into electrical energy at line frequency and re-turned back to the supply mains.

268. In a slip power recovery scheme for a 3-phase induction motor, if slip power is

(a) returned to supply, constant power drive is obtained.

(b) added to the main shaft, constant power drive is obtained.

(c) subtracted from the main shaft, constant torque drive is obtained.

(d) obtained from the supply, constant torque drive is obtained.
[A.M.I.E. Sec B. Summer 2000]

Answer: (b) added to the main shaft, constant power drive is obtained.

269. A three phase, wound rotor induction motor is to be operated with slip energy recovery in the constant torque mode, when it delivers an output power P_o at slip s. Then theoretically, the maximum power that is available for recovery at the rotor terminals, is equal to

(a) P_o

(b) $P_o s$

(c) $P_o/(1— s)$

(d) $P_o s/(1— s)$ [GATE E.E. 2000]

Answer: (b) $P_o s$

270. The stator and the rotor of a 3-phase, 4-pole wound rotor induction motor are excited respectively from a 50 Hz and 30 Hz source of appropriate voltage. Neglecting all losses, what is/are the possible no-load speed/speeds at which the motor would run?

(a) 1,500 rpm and 900 rpm.

(b) 2,400 rpm and 600 rpm.

(c) 2,400 rpm only.

(d) 600 rpm only. [U.P.S.C. I.E.S. 2005]

Answer: (b) 2,400 rpm and 600 rpm.

271. The motor that requires the most complicated arrangement for speed control is

(a) dc shunt motor.

(b) squirrel cage induction motor.

(c) stator supplied 3-phase commutator motor.

(d) rotor supplied 3-phase commutator motor.

Answer: (b) squirrel cage induction motor.

272. The factor(s) to be considered in selection of motor is/are

(a) voltage rating of the motor.

(b) kW output rating of the motor.

(c) speed and frame enclosure size.

(d) bearings and protection provided.

(e) all of the above.

Answer: (e) all of the above.

273. A 3-phase wound rotor induction motor, when started with load connected to its shaft, was found to start but settle down at about half synchronous speed. If the rotor winding as well as stator winding were star-connected, the cause of the malfunctioning could be attributed to

(a) one of the stator phase winding being short-circuited.

(b) one of the supply fuses being blown.

(c) one of the rotor phase being open-circuited.

(d) two of the rotor phases being open-circuited.

Answer: (c) one of the rotor phase being open-circuited.

274. Armature short-circuits can be detected and identified by test(s).

(a) growler

(b) bar-to-bar

(c) voltage drop

(d) any of these

Answer: (d) any of these

275. Induction generators deliver power at

(a) leading power factor only

(b) lagging power factor only.

(c) leading as well as lagging power factor.

(d) unity power factor only.

Answer: (a) leading power factor only

276. In a self excited induction generator, to keep the frequency of generated voltage constant with the increase in load, the speed of the induction machine should be

(a) increased.

(b) decreased.

(c) maintained less than the rated synchronous speed.

(d) maintained more than the rated synchronous speed. [U.P.S.C. I.E.S. E.E.-II, 1995]

Answer: (a) increased.

277. A 3-phase induction motor runs at super synchronous speed. For self excitation the machine

(a) draws real power from the mains.

(b) draws reactive power from the mains.

(c) feeds reactive power to the mains.

(d) generates emf at the expense of residual magnetism. [A.M.I.E. Sec B. Elec. Machines Winter 1994]

Answer: (b) draws reactive power from the mains.

278. Consider the following statements; If a 3-phase squirrel cage induction machine operates at a slip of - 0.05 (i.e. minus 0.05), then the machine will

1. draw electrical power from the mains.

2. draw mechanical power through the shaft.

3. deliver electrical power to the mains.

Of these statements

(a) 1,2 and 3 are correct.

(b) 1 and 2 are correct.

(c) 2 and 3 are correct.

(d) 1 and 3 are correct. [U.P.S.C. I.E.S. E.E.-II, 1996]

Answer: (c) 2 and 3 are correct.

279. Which of the following is not the advantage of an induction generator ?

(a) It does not hunt or drop out of synchronism.

(b) It is simple and rugged in construction, cheaper in cost and needs little maintenance.

(c) It delivers only leading current.

(d) When short circuited it delivers little or no sustained power.

Answer: (c) It delivers only leading current.

280. Which of the following is not the disadvantage of an induction generator ?

(a) It cannot be operated independently.

(b) When short circuited it delivers little or no sustained power.

(c) It can deliver only leading current.

(d) none of the above.

Answer: (b) When short circuited it delivers little or no sustained power.

281. An 8-pole wound rotor induction motor operating at 60 Hz supply is driven at 1,800 rpm by a prime mover in the opposite direction of the revolving field. The rotor current frequency is

(a) 60 Hz.

(b) 120 Hz.

(c) 180 Hz.

(d) none of the above. [A.M.I.E. Sec B. Elec. Machines Winter 1993, Summer 1997]

Answer: (c) 180 Hz.

282. A 3-phase induction machine draws active power 'P' and reactive power ' Q' from the grid. If it is operated as a generator, P and Q will respectively be

(a) positive and negative.

(b) negative and negative.

(c) positive and positive.

(d) negative and positive. [A.M.I.E. Sec B. Winter 2003]

Answer: (d) negative and positive.

283. In a 3-phase induction machine, motoring, generating and braking operations take place in the range of slip "s" given by

(a) motoring: 1 > s > 0; generating : 0 > s > – 1; braking : s > 1.

(b) motoring : s > 1; generating 1 > s > 0; braking ; 0 > s > –1.

(c) motoring: s > 1; generating 0 > s > –1 braking : 1 > s > 0.

(d) motoring: 0 > s > — 1; generating : s > 1; braking : 1 > s > 0. [U.P.S.C. LE.S. E.E.-II, 1994]

Answer: (a) motoring: 1 > s > 0; generating : 0 > s > – 1; braking : s > 1.

284. In a 3-phase induction machine, motoring, generating and braking operations take place in the range of slip "s" is

(a) 1 > s > 0, 0 > s > –2 and s > 1

(b) s > 1, 1 > s > –1 and 0 > s > –1

(c) s > 1, 0 > s > –1 and 1 > s > 0

(d) 0 > s > –1, s > 1 and 1 > s > 0

Answer: (a) 1 > s > 0, 0 > s > –2 and s > 1

285. Which of the following statements about synchronous-induction motors is incorrect?

(a) It is basically a wound rotor induction motor with fewer and larger slots on rotor.

(b) It has a very small air gap as expected in a plain induction motor.

(c) It is connected to 3-phase ac supply on stator side and to dc on rotor side.

(d) It starts as an induction motor and runs as a synchronous motor.

(e) It is provided with a heavy rotor winding.

Answer: (b) It has a very small air gap as expected in a plain induction motor.

286. The synchronous impedance of a synchronous-induction motor is much larger than that of a synchronous motor due to

(a) its larger air gap.

(b) presence of damper bars in it.

(c) its less magnetic reluctance.

(d) supply of dc excitation to its 3-phase rotor.

Answer: (c) its less magnetic reluctance.

287. Synchronous-induction motors

(a) are used where high starting torque is required.

(b) can be operated on full load on any desired pf.

(c) are very often installed along with other induction motors in order to improve the overall power factor of the system.

(d) have been made for rating up to 30,000 kW.

(e) all of the above statements regarding synchronous induction motors are correct.

Answer: (e) all of the above statements regarding synchronous induction motors are correct.

288. The secondary of a linear induction motor normally consists of a

(a) concentrated single phase winding.

(b) distributed single phase winding.

(c) solid conducting plate.

(d) distributed three phase winding.

Answer: (c) solid conducting plate.

289. Linear induction motor is used in

(a) traction.

(b) magnetic attraction.

(c) mechanical workshops.

(d) textile mills.

Answer: (a) traction.

290. A Schrage motor is a variable speed commutator type three phase induction motor and has three windings,

(a) all the three windings located in stator.

(b) all the three windings located in rotor.

(c) two windings in rotor and one winding in stator.

(d) two windings in stator and one winding on rotor.

Answer: (c) two windings in rotor and one winding in stator.

291. The primary winding of a Schrage motor is located

(a) in stator.

(b) in lower part of the rotor.

(c) in upper part of the rotor.

(d) partly in stator and partly in rotor.

Answer: (b) in lower part of the rotor.

292. For starting a Schrage motors 3-phase supply is connected to

(a) rotor via slip-rings.

(b) secondary winding via brushes.

(c) regulating windings.

(d) stator windings as in an ordinary induction motor.

Answer: (a) rotor via slip-rings.

293. Which of the following statements about Schrage motor is incorrect?

(a) it gives normally speed range of 3 to 1 but much speed ranges upto 15 to 1 and higher may also be obtained.

(b) It is cheaper than the slip-ring induction motor.

(c) Its efficiency is higher than that of a slip-ring induction motor at all speeds except synchronous speed and is very much high at lower speeds.

(d) While operating exactly at synchronous speed it behaves, in a sense, like a synchronous motor with compensating winding functioning as a dc exciter.

Answer: (b) It is cheaper than the slip-ring induction motor.

294. Which of the following statements associated with a Schrage motor is/are correct ?

(a) The magnitude of the slip frequency voltage injected into the secondary circuit depends upon the spacing between the two sets of brushes, and the phase depends on their angular position with respect to centre of the rotor winding.

(b) When the two sets of brushes of each phase are making contact with the same commutator bar, the secondary is short-circuited and the motor operates as an ordinary induction motor.

(c) Its power factor can be varied by rocking the brushes as a whole round the commutator.

(d) all of the above.

Answer: (d) all of the above.

295. A 3-phase slip-ring induction motor is fed from the rotor side with stator winding short circuited. The frequency of the currents in the short-circuited stator is

(a) slip frequency.

(b) supply frequency.

(c) frequency corresponding to rotor speed.

(d) zero. [GATE E.E. 1953]

Answer: (a) slip frequency.

296. A 3-phase induction motor is fed from a balanced 3-phase supply on the rotor side, short-circuiting the stator terminals. The speed of the rotating magnetic field is

(a) zero.

(b) equal to rotor speed.

(c) equal to synchronous speed. [AMIE. Sec B. Winter 1994]

(d) equal to slip speed.

Answer: (d) equal to slip speed.

297. In particular motor there is a stator 3 phase winding and a short-circuited rotor winding. The motor runs at synchronous speed but does not need any dc excitation. The motor is

(a) 3-phase induction motor.

(b) 3-phase synchronous motor.

(c) 3-phase reluctance motor.

(d) hysteresis motor.

Answer: (c) 3-phase reluctance motor.

298. When the stators of two slip-ring induction motors are fed from a common 3-phase ac supply in parallel and the rotor windings are connected in opposition, they are called

(a) power selsyns.

(b) position selsyns.

(c) power synchros.

(d) position synchros.

Answer: (a) power selsyns.

299. Position synchros normally have …….. phase stator winding and …….. phase rotor winding.

(a) three, single

(b) single, three

(c) three, three

(d) single, single

Answer: (a) three, single

300. Phase advancers are employed with large induction motors to

(a) regulate their speeds.

(b) reduce copper losses.

(c) improve power factor.

(d) reduce noise and vibrations.

Answer: (c) improve power factor.

301. Which of the following statements about a phase advancer is incorrect?

(a) It is a particular type of ac exciter which may be connected in the rotor circuit of an induction motor to improve power factor.

(b) It uses the principle of injection through slip-rings of the motor a current leading with regard to the rotor voltage.

(c) It resembles with an induction motor in construction.

(d) Its kVA capacity needs be only 5% or less of kVA correction affected in the main supply circuit.

(e) it has compensating windings on the stator to ensure good commutation.

Answer: (c) It resembles with an induction motor in construction.