Energy conversion-II

Two mark questions

1. write the advantages of short pitch winding over full pitch winding .
2. what do you mean by hunting .
3. Why damper bars are used in synchronous motor .
4. Write the maintenance schedule of power transformer .
5. Why centrifugal switch is used single phase induction motor .
6. Define pitch factor and write its value for full pitch winding .
7. Name the sources of harmonics .
8. Write the four application of hybrid stepper motor .
9. Why synchronous motor is not self-starting ?
10. What are the condition of synchronization 3 phase transformer .
11. Define slip speed in 3 phase induction motor and state in equation .
12. What is plugging in 3 phase induction motor .
13. Define pitch factor in alternator and state its value .
14. What is the purpose of damper windigs in alternators ?
15. State two application of synchronous motor .
16. What is the V-curves in synchronous motor ?
17. Define step angle in stepper motor and state its value .
18. How single phase induction motor is made self starting ?
19. What is the function of compensated winding in compensated repulsion motor ?
20. How the direction of rotation of split phase induction motor can be reversed ?
21. Why rotor slots of an induction motopr are skewed ?
22. What is plugging ?
23. Write down the advantages of stationary armature of alternator .
24. What do you mean by voltage regulation of an alternator ?
25. What is damper bar or damper winding ?
26. State the application of synchronous motor .
27. How the direction of rotation of a φ IM can be reversed ?
28. Write diwn the uses of universal motor .
29. Define the step angle of a stepper motor .
30. What are the conditions required for [parallel operation of 3-φ transformer ?
31. What is the measure difference between squirrel-cage induction motor and phase wound type induction motor ?

32. How can thev direction of rotation of the 3φ I.M. be reserved ?
33. Why parallel operation of alternator is needed ?
34. What is hunting ?
35. Calculate the pitch factor for the winding which has 36 slots , 4 poles and coil span is 1 to 7 .
36. What are the modes of operation of an induction machine ? in which operating mode,the developed torque oppose the rotation of rotor .
37. What are the different vector groups of 3-φ transformer winding connections ?
38. What is the function of thermal overload relay and fuses present in the direct-on line starter of an induction motor ?
39. What do you mean by an infinite bus ?
40. Which type of alternator is used in hydro-electric power plants and why ?
41. What is the relation between electrical degrees and mechanical angle of an alternator ?
42. State the difference between coil pitch and pole pitch .
43. State pitch factor and distribution factor .
44. Calculate slip for 4-pole , 3-phase, 50 Hz induction motor running at 1440 r.p.m.
45. What is the function of dumper bar ?
46. Why a starting winding is needed for single phase motor ?
47. What is the difference between a power transformer and distribution transformer ?
48. In which rotor high starting torque is prosduced and why ?
49. AC series motor .
50. What are the type of alternator ?
51. What do you mean by distribution factor ?
52. Why transfer rating is expressed in KVA ?
53. Write the application of universal motor .
54. What is volatage regulation ?
55. What is the purpose of damper bars in synchronous m/c ?
56. What frequency voltage must be applied to a 20 poles synchronous motor so that it runs at a speed of 300 rpm .
57. Can a 3φ I.M. never run at synchronous speed ?
58. How frequency of rotor current is related to slip ?
59. What is slip of an induction motor ?
60. Why are alternator rated in KVA and not kw.
61. Why 1φ induction motors are not self starting ?
62. If a 1φ motor fails to start but gives a humming sound, what is the reason behind it ?

63. What are the two advantages of short pitch coil in an alternator wdg.
64. A 3φ I.M. has rotor resistance per phase of 0.2 Ω and reactance of 20Ω what will be slip at max. torque condition .
65. The dc armature resistance of a delta connected alternator measured across its two terminates is 2Ω. What is the per phase resistance .
66. Calculate to value of `Kd` for a 36 slots ,4 poles single layer 3φ alternator .

Five mark questions

1. Derive the EMF equation of synchronous generator .
2. Explain verify torque-slip characteristics of 3 phase induction motor with the help of characteristics diagram.
3. A 4 poles ,3 phase induction motor operates from a supply is 50 Hz ,calculate;
   (i)   The speed at which the magnetic field of the stator is rotating.
   (ii)   The speed of the rotor in which slip is 0.04.
   (iii)   The frequency of the rotor currents when the slip is 0.03.

4. Explain verify working principle and applications of shaded pole induction motor with the help of the diagram.
5. With the help of diagram explain armature reaction of an alternator and its effect at different power factor of load .
6. Explain verify the effect of veryfing excitation with constant load in synchronous motor.
7. A synchronous motor having 40% reactance and a negligible resistance is to be operates at reated load at (i) unity p.f (ii) 0.8 p.f. lag (iii) 0.8 p.f. lead.what is the value of induced e.m.f. ?
8. Explain verify working principle and application opf universal motor.
9. Write short notes on plugging .
10. Explain the principle of operation of synchronous motor in details.
11. Describe the power flow stages in 3 phase induction motor with neat diagram.
12. Derive the relation between torque and rotor power in 3 phase induction motor.
13. Explain about the determination of voltage regulation of alternator by synchronous impedance method.
14. Describe about the types of rotors in alternator in details.
15. Write a short note on capacitor start induction run motors.
16. Explain the 1-phase ON of full step operation in variable reluctance stepper motor verify.
17. A 8-pole. 50 Hz. 3 phase slip ring induction motor has effective rotor resistance of 0.08Ω per phase .stalling speed is 650rpm. How much resistance must be inserted in the rotor

phase to obtain maximum torque at starting ? Ignore the magnetizing current stator leakage impedance.

18. Derive the equation for distribution magnet stepper motor.

19. Explain the working of permanent magnet stepper motor.

20. Explain double field revolving theory in single phase induction motor.

21. What are the advantages and conditions for parallel operation of three phase transformer ?

22. Describe the speed torque characteristics of three phase induction motor.

23. Derive an expression for the starting torque of a slip ring induction motor. Find condition for maximum torque.

24. Derive the condition for maximum torque of 3-ϕ I.M. under running condition.

25. Explain about the working principle of 3-ϕ I.M.

26. What do you mean by voltage regulation ? how do you find the regulation of alternator by synchronous impedance method ?

27. Derive expression for distribution factor of an alternator.

28. Explain about torque slip characteristics of 3-phase induction motor.

29. Explain about principle of operation of 3-ϕ synchronous motor.

30. Derive the relation between full load torque and starting torque in case of a 3-ϕ induction motor.

31. Derive an expression for the starting torque of a slip ring induction motor.

32. Explain how asynchronous motor acts as a synchronous condenser with the help of vector diagram.

33. Explain hunting of synchronous motor.

34. A 500 V, 50 KVA , 1-phase alternator has an effective resistance ocf 0.2Ω. A field current of 12 A produces an armature current of 200 A on short circuit and an emf of 450 V on open circuit .Calculate the full load regulation at p.f. 0.8 lagging.

35. Write down the condition for parallel operation of a 3-phase transformer.

36. State and explain maintenance schedules of a power transformer .

37. What is the effect of changing excitation on constant load of a synchronous motor ?

38. A 4-pole alternator has 18 slots\pole, single layer three phase wdg. The first coil lies in slots 1 and 16 . Calculate distribution factor and pitch factor.

39. Mention some specific applications of synchronous motor.

40. A 660 V , 3-ϕ star connected alternator has a syn. Impedance of (0.4+j6)Ω per phase . Determine the voltage regulation of the m/c when supplying a load of 1000 kw at normal voltage at 0.866 pf lag and also at u.p.f.

41. Write short notes of synchronization ?

42. A 8-pole , 3-phase , 50 Hz I.M. has rotor resistance of 0.025 Ω/ph and arotor stand still reactance of 0.1Ω per phase .at what speed the torque it mas. What proportion of max. torque its starting torque.
43. Explain ferrari's principle for a 1-phase motor.
44. Give possible reasons why 3φ induction motor fails to start ?
45. Write maintenance schedule of transformer.

TEN MARK QUESTIONS

1. Write short notes on Plugging. A 3 phase induction motor having a 6 pole, star connected stator winding runs on 240V, 50 Hz supply. The rotor resistance and standstill reactance are 0.12 Ω and 0.85 Ω per phase. The ratio of stator to rotor turns is 1.8. Full load slip is 4%. Calculate the developed torque at full load, maximum torque and speed at maximum torque.

2. From the following rest results, determine the voltage regulation of a 2000 V, 1-phase alternator delivering a current of 100A at (i) unity p.f. (ii) 0.8 leading p.f. and (iii) 0.7 lagging p.f. Test results: Full load current of 100 A is produced on short circuit by a field excitation of 2.5A. An e.m.f. of 500v is produced on open circuit by the same excitation. The armature resistance is 0.8Ω.

3. Write the condition for parallel operation of an alternator and explain it by using dark and bright lamp method.

4. Calculate the R.M.S. value of the induced e.m.f per phase of a 10-pole, 3-phase, 50Hz alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150 degree. The flux per pole has a fundamental component of 0.12 wb and a 20% third component.

5. Derive the relationship between rotor input, mechanical power and copper loss in 3-phase induction motor.

6. Explain about the double-field rovolving theory in 1-phase induction motor with torque-slip graph.

7. Describe the synchronizing of 3-phase alternator using two bright and one dark lamp method.

8. Write a short on :
   (a) Direct-On-Line Stator.
   (b) Parallel Operation of Alternators.

9. Explian the effect of excitation on armature current and power factor in synchronous motor in details.

10. What is armature reaction in an alternator ? Explain with phasor diagram the effect of generated voltage when load is : (a) Resistive (b) Pure inductive (c) Pure capacitive

11. An 18.65 KW. 4 poles. 50 Hz. 3-phase induction motor has friction and windage losses of 2.5 percent of the output. The full load slip is 4%. compute for full load.
    (i) the rotor cu loss
    (ii) the rotor input
    (iii) the shaft toreae
    (iv) the gross magnetic torque

12. The following test results are obtained from a 3-phase 6000 KVA. 6600V star connected. 2 pole. 50 Hz alternator. (i) With a field current of 125A, the open voltage is 8000V at rated speed. (ii) With the same field current and rated speed the short circuit current is 800A. At the rated full- load, the resistance drop is 3 percent. Find the regulation of the alternator on full load and at a power factor of 0.8 lagging.

13. Explain the effect of change of excitation of a synchronous motor driving a constant load.

14. Explain construction, working principle and applications of universal motor.

15. Explain how 3ɸ supply produced a rotating magnetic field.

16. A 3ɸ I.M. having a Y. connected rotor has an induced emf of 85V between slip rings at stand still on open circuit. The rotor has a resistance and reactance per phase of 1.5Ω and 4.2Ω respectively. Calculate current/phase and power factor when
    (i) Slip rings are short circuited. (ii) Slip rings connected to a Y-connected rheostat of (4+j3)Ω.

17. A 440V, 50 kVa, 1-phase alternator has an effective resistance of 0.2Ω. A field current of 10A produces an armature current of 200A on short circuit and emf of 420Ω on open circuit. Calculate the full-load regulation at p.f. 0.8 lag.

18. Explain about armature reaction of alternator.

19. A 3 phase, 50 Hz 6 pole induction motor has a shaft power of 10 KW at 950 rpm. Friction and windage losses are 2% of output. If the total stator copper loss 500W.(i)Determine the rotor input and stator input (ii) If maximum torque developed at 900 rpm. Calculate the starting torque with rated voltage.

20. Derive the equation for distribution factor of an alternator. State the expression for emf equation of an alternator showing the effect of pitch factor and distribution factor.

21. Explain with vector diagram effect of excitation on armature current and power factor of a synchronous motor.

22. Double field revolving theory.

23. Principle of operation of shaded pole motor.

24. Maintainace of 3-phase transformer.

25. A 3-φ , 4 pole 50 Hz induction motor has a star connected rotor. The voltage of each rotor phase at standstill and on open circuit is 121 V. The rotor resistance per phase is 0.3 Ω and reactance at standstill is 0.8 Ω. If the rotor current is 15 A, calculate the speed at which the motor is running. Also calculate the speed at which the torque is maximum and corresponding value of I/P power to the motor, assuming flux remaining constant.

26. A 8-pole, 50 Hz, 3-φ slip ring induction motor has effective rotor resistance of 0.08 Ω /ph. Stalling speed is 650 r.p.m. how much resistance must be inserted in the rotor phase to obtain the maximum torque at starting. Ignore the magnetising current and stator leakage impedance.

27. A 6-pole, 50 Hz, 3-phase induction motor running on full load with 4% slip develop a torque of 148 N- m. at it's pulley rim. The Friction and windage losses are 200 W and stator copper and iron loss equal to 1620 W. Calculate:
    (i) Output power (ii) Rotor Copper Loss (iii) Efficiency at full load.

28. A 3-φ, 50 Hz, star connected 2000 kVA, 2300 V Alternator gives a short circuit current of 600 A. For a certain field excitation, with the same excitation the open circuit voltage was 900 V. The resistance between a pair of terminal was 0.12 Ω. Find the full load regulation at (i) U.P.F. (ii) 0.8 lagging

29. A 6-pole, 50 Hz, 3-φ Induction Motors has rotor resistance and reactance per phase of 0.02 Ω and 0.1Ω respectively. At what spee is the torque maximum? What must be the value of external rotor resistance/phase to produce two-third of the maximum torque at starting?

30. A 3-φ I.M at stand still has 120 volt induced between its slip ring termnals. The rotor wdg, is star connected and has resistance and stand still reactance of 0.2Ω and 1Ω per phase respectively. Calculate the rotor current when the slip is 3% and the rings are S.C and the slip when the rotor developes max. torque.

31. With a neat sketch explain the working of a Repulsion motor.

32. A 3φ,6600 v 50 HZ, star connected synchornous motor takes 50 A current. The resistance and syn reactance per phase are 0.9 Ω 18Ω respectively find the power supplied to the motor and induced emf for a pf of (a) 0.75 lag (b) 0.7 lead.

33. A 105 kvA, 3000 V, 50HZ, 3φ star connected has effective armature resistance of 0.18 Ω the filed current of 40 A produceds S.C current of 200 A and an O.C of 1000 V (line emf). Calculate theh full load voltagte regulation at 0.8 pf lag and 0,75 pf leading. Draw the phasor diagrams.

34. An 20 kw, 4-pole, 50 HZ, 3φ I.M has frictio and windag losses of 2.5% of the output. The full load slip is 5%. Compute the f.l (a) the rotorch. loss 9b) the rotor i/p (c) the shaft torque (d) the gross electro magnetic torque.