COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT : ELECTRICAL
SEMESTER: 4TH
SUBJECT NAME: ELECTRICAL MACHINE - I
SUBJECT CODE : 3140913
FACULTY NAME: SUNIL PATEL

QUESTION BANK

1. Write a list of the speed control methods for DC motors.

2. A 37.3 KW, 460 V, DC shunt motor running at no load takes a current of 4 A and runs at a speed of 660 rpm. The armature resistance is 0.3 Ohm and Shunt field resistance is 270 Ohm. Find the (1) Input current and (2) Speed, when the motor is running at full load. Assume that no load input of armature circuit is equal to iron and rotational losses.

3. Derive the EMF equation of a DC generator from first principle.

4. Explain the procedure and calculations for Field test on identical DC series machines.

5. Derive the equation of pitch factor for short pitch coil. Briefly describe the role of compensating winding.

6. Draw the schematic diagrams and explain the winding connections for the short shunt and long shunt compound generators.

7. Briefly describe the voltage build up process of a self excited DC shunt generator.

8. Briefly explain the concept of electrical degree and mechanical degree in case of rotating machines.

9. Draw the schematic diagram and explain the solid state speed control (Speed control using power electronic switches) of DC motors.

10. Explain the power flow diagram of a DC machine.

11. Draw and explain the internal characteristic of a DC shunt generator.

12. Mention the parts of a DC machine. Explain the use of any one of them.

QUESTION BANK

13. An 8-pole DC generator has 500 armature conductors and has a useful flux per pole of 0.065 Wb. What will be the emf generated if it is lap connected and runs at a speed of 1000 rpm? What must be the speed at which it must be driven to produce the same emf if it is wave wound?

14. Derive the equation of efficiency of DC machine as a motor and as a generator.

15. Derive the emf equation of a DC generator.

16. What is the necessity of starter in a DC motor?

17. Draw neat sketch of 3-point and 4-point starter by indicating its part.

18. Derive the torque equation of a DC motor from first principles.

19. What is armature reaction? Discuss any one method to counterbalance armature reaction.

20. Draw the circuit diagram and explain the Hopkinson's test for DC shunt Machines in detail.

21. Explain critical field resistance of d.c. shunt generator with its significance.

22. 4. A 4-ole 250V wave –connected shunt motor gives 10Kw when running at 1000 r.p.m. and drawing armature and field currents of 60A and 1A respectively It has 560 conductors. Its armature resistance is 0.2 Ω. assuming a drop of 1V per brush, determine (a) total torque; (b) useful torque; (c) useful flux per pole (d) rotational losses; (e) efficiency.

23. A 4-pole, long-shunt lap wound generator supplies 25 kW at a terminal voltage of 500 V. The armature resistance is 0.03 Ω, series field resistance is 0.04 Ω and shunt field resistance is 200 Ω. The brush drop may be taken as 1V.Determine the e.m.f. generated. Also calculate the No. of conductors if the speed is 1200 r.p.m. and flux per pole is 0.02 Weber. Neglect armature reaction.

24. The Hopkinson's test on two identical shunt machines gave the following results: Input voltage =500 V; input current = 15 A; output current of generator= 120A; Field current of generator= 4 A Field current of motor =3 A Armature resistance of each machine =0.06 Ω . Find the efficiency of motor and generator.

QUESTION BANK

25. A long shunt dynamo running at 1000rpm supplies 20KW at 220V and 85% efficiency. The resistance of shunt, series and armature windings are 0.04Ω, 110 Ω and 0.05 Ω respectively. Find Copper loss and Iron-friction loss.

26. Explain the Swinburne's test on DC motor with circuit diagram.

27. Give the comparison between core and shell type transformers.

28. Derive equation Et = k√Q where Q = kVA rating of a transformer. Explain how service conditions of transformer affect the value of K.

29. Determine the main dimensions of core and yoke for a 200 KVA, 50 Hz, 1-phase core type transformer. Use the following data: Window space factor=0.32, Current density=3A/mm2, Maximum flux density=1.1 Wb/m2, Voltage per turn=14 V, Stacking factor=0.9.Net iron area=0.56d2, where d is the diameter of circumscribing circle. Cruciform core is used with distance between adjacent limbs=1.6 times width of core lamination. The width of the largest stamping is 0.85d.

30. Explain why tapings are usually provided on HV side in a transformer.

31. Explain the importance of stepped core in transformer.

32. What is design optimization? Derive necessary condition for designing a transformer with minimum cost.

33. A 250KVA, 6600/400 V, 3-Phase core type transformer has a total loss of 4800 W at full load. The transformer tank is 1.25 m in height and 1m x 0.5m in plan. Designs a suitable scheme for tubes if the average temperature rise is to be limited to 35 oC.The diameter of tubes is 50 mm and is spaced 75 mm from each other. The average height of the tube is 1.05 m.specific heat dissipation due to radiation and convection is respectively 6 and 6.5 W/m2-0C.Assume that convection is improved by 35% due to provision of tubes.

34. Give the comparison between power transformer and distribution transformer.

QUESTION BANK

35. What are the major losses in transformer? Derive the condition for getting maximum efficiency of a transformer.

36. How will the output, losses and efficiency in transformer vary with linear dimensions?

37. Explain the factors affecting the choice of flux density and current density in the design of transformer.

38. Determine the main dimensions of the core for a 5 kVA , 11000/400 V, 50 Hz, single phase core type distribution transformer. The net conductor area in the window is 0.6 times the net cross section of iron in the core. Assume a square cross-section for the core, a flux density 1 Wb/m2 , a current density 1.4 A/mm2,and a window space factor 0.2. The height of window is 3 times its width.

39. Differentiate between Radial Forces and Axial Forces in transformer windings.
    From the design data discuss how no load current can be estimated in 3-phase core type transformer.

40. Explain: (a) Significance of mitered joints in transformer.
    Derive the equation of leakage reactance of 3 phase core type distribution Transformer.

41. The current densities in the primary and secondary windings of a transformer Are 2.2 and 2.1 A/ mm2 respectively. The ratio of transformation is 10 : 1 and the length of the mean turn of the primary is 10 percent greater than that of the Secondary. Calculate the resistance of the secondary winding given that the primary winding resistance is 8 Ω.

42. Explain different cooling methods used in oil immersed transformer.

43. Explain criteria for selection of specific loading.