Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 2023
ELECTRICAL AND ELECTRONICS ENGINEERING
(2020 SCHEME)

Course Code : 20EET202

Course Name: DC Machines And Transformers

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain the significance of using equalizer rings in DC machines.
2. Define the terms (i) front pitch (ii) back pitch and (iii) pole pitch.
3. What are the conditions for voltage buildup of a DC shunt generator.
4. List any three applications of DC generator.
5. What is the purpose of using starter in DC motors.
6. Explain speed control by armature control of DC shunt motor.
7. Compare core and shell type transformers.
8. What are the various losses in a transformer.
9. Compare power and distribution type transformers.
10. What is the purpose of tertiary winding in three phase transformers.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) With a neat schematic diagram, explain the construction of a DC machine. (10)
    b) What is the function of dummy coils in dc machines. (4)

OR

12. a) A 4 pole, simplex lap wound armature contains 16 slots and has two coil sides per slot. Find back pitch, front pitch and commutator pitch for (i) progressive winding (ii) retrogressive winding. (8)
    b) Compare lap and wave windings. (6)

MODULE II

13. a) Explain methods of improving commutation. (8)
    b) A short shunt compound generator delivers a load current of 30 A at 220 V, and has armature, series field and shunt field resistances of 0.05 Ω, 0.30 Ω and 200 Ω respectively. Calculate the induced emf and armature current. Assume 1 V per brush for contact drop (6)

OR

14. a) What are the necessary conditions of parallel operation of a DC generator and explain parallel operation of shunt generators (8)

b) A shunt generator delivers 195 A at a terminal voltage of 250 V. The armature resistance and shunt field resistances are 0.02 Ω and 50Ω respectively. The iron and frictional losses is 950 W. Find (a) EMF generated (b) copper losses (c) output of prime mover. (6)

MODULE III

15. a) Explain how efficiency can be determined by Hopkinson's test? What are advantages of this method. (10)

b) Explain the significance of back emf in DC motor (4)

OR

16. a) Derive the expressions of armature torque and shaft torque of DC motor. (7)

b) A 20 kW, 250 V DC shunt generator has armature and field resistances of 0.1 Ω and 125 Ω respectively. Calculate the total armature power developed when running (i) as a generator delivering 20 kW output (ii) as a motor taking 20 kW output. (7)

MODULE IV

17. a) Draw and explain the phasor diagram of transformer on inductive load. (8)

b) Draw and explain the equivalent circuit of a single-phase transformer. (6)

OR

18. a) Explain SC and OC test of a single-phase transformer. (7)

b) A 11000/230 V, 150 kVA, single phase, 50 Hz transformer has core loss of 1.4 kW and full load copper loss of 1.6 kW. Determine (i) kVA load for maximum efficiency and value of maximum efficiency at unity pf (ii) the efficiency at half full load 0.8 pf leading. (7)

MODULE V

19. a) Derive an expression to justify the saving of copper in auto transformer with respect to an ordinary two winding transformer with same rating. (8)

b) Explain on load tap changer. (6)

OR

20. a) Explain the various 3 phase transformer connections. (8)

b) Explain any 3 vector groupings of 3 phase transformer. (6)

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