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Reg. No. : .....

Name : .....

**Third Semester B.Tech. Degree Examination, January 2015  
(2008 Scheme)**

**08.306 : ELECTRICAL MACHINES – I (E)**

Time : 3 Hours

Max. Marks : 100

**Instructions :** Answer *all* questions from Part – A (4 marks *each*) and *any one full* question of Part – B from *each* Module (20 marks *each*).

**PART – A**

1. Do dc generator generates energy ? Justify the answer.
2. Define the following terms :
  - 1) Progressive winding
  - 2) Pole pitch
  - 3) Coil span
  - 4) Commutator pitch.
3. Derive the emf equation of a DC generator.
4. What are the condition in which a self excited DC generator fails to buildup voltage ?
5. Explain different methods of speed control in DC shunt motor.
6. Why DC shunt motor is called self regulating machine ?
7. Enumerate losses in a DC machine.
8. Explain the OC test on single phase transformer and parameters obtained from it.
9. What are the advantages of single three phase transformer over same rating of 3 single phase transformer ?
10. Explain constructional details of an autotransformer. **(10×4=40 Marks)**





## PART – B

## Module – I

11. a) Explain armature reaction effects produced in a DC machine with relevant diagrams and suggest methods to rectify it. 10
- b) Two shunt generators A and B operate in parallel and their load characteristics may be taken as straight lines. The voltage of A falls from 240 V no load to 220 V at 200 A, while that of B falls from 245 V at no load to 220 V at 150 A. Determine current which each machine supplies to a 300 A and the bus bar voltage at this load. 10

OR

12. a) Describe with schematic diagrams the various methods of excitation in DC machine. 8
- b) The DCC of a DC shunt generator driven at 400 rpm is given below :
- |                                 |     |     |     |     |     |     |     |     |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>Field current (amperes)</b>  | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   |
| <b>Terminal voltage (volts)</b> | 110 | 155 | 186 | 212 | 230 | 246 | 260 | 271 |
- Find :
- Maximum value of voltage to which the machine will exit at 400 rpm with shunt field resistance of  $34 \Omega$ .
  - Critical speed for shunt field resistance of  $34 \Omega$ .
  - Resistance to be added with field to reduce open circuit voltage to 220 V at 400 rpm.
  - Critical field resistance of the machine. 12

## Module – II

13. a) What are the different speed control methods in a DC series motor ? Explain with neat diagram. 8
- b) The Hopekinson's test on two similar dc shunt machines, gave the following full load data :
- Line voltage – 110 V, Line current – 48 A
- Motor armature current – 230 A, field currents are 3 A and 3.5 A,  $R_a = 0.0325 \Omega$ , Brush drop = 1V/brush. Calculate the efficiency of each machine. 12

OR





14. a) What is the necessity of starter for DC motor ? With the help of a diagram, explain the working of a 3-point starter for DC shunt motor. 10
- b) A 500 V, 50 hp, 100 rpm DC shunt motor has on full load an efficiency of 90%. The armature circuit resistance is  $0.24 \Omega$  and there is a total brush drop of 2 V at the brushes. The field current is 1.8 A. Determine :
- 1) Full load line current
  - 2) Full load shaft torque in N-m and
  - 3) Total resistance in motor starter to limit starting current to 1.5 time  $I_{FL}$ . 10

**Module – III**

15. a) Discuss how will perform O.C. and S.C. test on single phase transformer with neat connection diagram. From the test results how will you find efficiency and regulation, efficiency and equivalent circuit. 10
- b) Explain working of tap changing transformer with the help of neat diagrams. 5
- c) Find the expression for saving of copper in an auto-transformer. 5

OR

16. a) Explain Sumpner's test on transformer. Bring out its merits and demerits. 10
- b) The OC and SC test on a 300/600 V, 50 Hz single phase transformer gave the following results :

**OC test** : LV side 300 V, 0.8 A, 70 W

**SC test** : HV side 20 V, 12 A, 90 W

Find the equivalent circuit of the transformer referred to LV side and also calculate the secondary voltage when delivering 6 kW at 0.8 pf lagging. 10

