

Code: EE3T2

**II B.Tech - I Semester–Regular/Supplementary Examinations –  
November 2018**

**ELECTRICAL MACHINES - I  
(ELECTRICAL & ELECTRONICS ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

**PART – A**

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

- a) Why brushes are made up of soft conducting material in case of DC machine?
- b) Why inter pole winding is connected in series with the armature winding?
- c) What is residual magnetism and why it is required for a self-excited DC generator?
- d) What is purpose of equalizer bar in parallel operation?  
What type of DC generators need it in parallel operation?
- e) Write the equation that relates speed and torque of a DC shunt motor.
- f) What is the purpose of no volt (or low volt) release coil in a DC motor starter? How it is connected in various types of DC motor starters?

- g) Mention the drawback of ward-Leonard method of speed control of DC motors and how it can be overcome by solid state speed control?
- h) List merits and demerits of Hopkinson's test on DC machines.
- i) Give any two applications of amplidyne.
- j) What is the purpose of third brush in three brush generator? Mention the applications.
- k) Draw the speed torque characteristics of DC compound motor.

### PART – B

Answer any **THREE** questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) What is lap winding and wave winding? What is the significance of lap winding and wave winding in the emf equation of a DC machine? How can you say that power rating of a DC machine is independent of number of parallel paths? 8 M

b) Design Demagnetizing and cross magnetizing Ampere turns per pole of a DC machine for the details given below if the brushes are placed at (i) geometric neutral axis (ii)  $5^\circ$  electrical from the geometric neutral axis.  
No. of poles = 6, Current rating of the machine = 148 A,  
Number of conductors = 148, Field current = 2 A. 8 M

3. a) Why parallel operation of DC generators are required? What are the conditions (list only) to be full filled for parallel operation of DC generators? What is the procedure to connect a DC generator to the bus bar?

8 M

b) In a 50 kW, 230/250 V (230 V on no load and 250 V on full load) over compounded DC generator (long shunt) the flux per pole required to produce 230 V on no load at 1050 rpm is 0.06 Wb. The resistance of the armature and series field are  $0.04 \Omega$  and  $0.01 \Omega$  respectively and the shunt field resistance is  $100 \Omega$ . Calculate the value of flux per pole at full load, 1000 rpm. Neglect brush drop.

8 M

4. a) Derive expression for electromagnetic torque of DC machine in terms of its field flux and armature current.

8 M

b) A 440 V, 80 A, 1200 rpm DC shunt motor has an armature resistance of  $0.55 \Omega$ . Determine the resistance of each step of the starter for accomplishing starting in 4 steps. The maximum load current should not exceed 150 A. Neglect field current.

8 M

5. a) What is Swinburne's test? Why it is conducted? What are merits and demerits of this test? Write its step by step procedure and related calculations to find efficiency. 8 M
- b) A 200 V DC series motor runs at 500 rpm when taking a current of 25 A. The resistance of armature is  $0.5 \Omega$  and that field is  $0.3 \Omega$ . If the current remains constant, calculate the resistance necessary to reduce the speed to 250 rpm. 8 M
6. a) What is cross field machine? Why it consists of two polar projection? Explain its operation as amplidyne. 8 M
- b) Analyze what will happen when AC supply is given to DC series motor? What are the modifications required to operate satisfactorily on AC supply? How to improve power factor? 8 M