

Code: R7210206**R07**

B.Tech II Year I Semester (R07) Supplementary Examinations, May 2013

ELECTRICAL MACHINES - I
(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 80

Answer any FIVE questions
All questions carry equal marks

1. (a) Distinguish between singly excited and multi excited magnetic field systems.
(b) Describe the principle of energy-conversion. From a consideration of the various energies involved, develop the model of an electro mechanical conversion device.
2. (a) Derive the emf equation of a DC generator.
(b) Explain the constructional features of DC machine.
3. (a) What is the purpose of compensating windings? Explain in detail.
(b) A 220 KW, 8-pole wave connected, 400 V shunt generator has 720 conductors and a shunt field current of 8 A. Find the demagnetizing and cross magnetizing ampere turns per pole, if the brushes are given a lead of 20 electrical degrees. Find the number of additional shunt field turns to neutralize the demagnetizing effect.
4. (a) Discuss the process of self excitation in a DC machine. What conditions must be fulfilled for the machine to self excite?
(b) A 4-pole lap wound shunt generator supplies to 50 lamps of 100 W, 200 V each. The field and armature resistance are 50 ohms and 0.2 ohms respectively. Allowing a brush drop of 1 V each brush, calculate the following:
(i) Armature current (ii) Current per path (iii) Generated emf (iv) Power output of DC armature.
5. (a) Discuss the necessity for parallel operation of generators and explain the parallel operation of DC series generators.
(b) The two DC shunt generators with emf's of 120 V and 115 V, armature resistances of 0.05 ohm and 0.04 ohm and field resistance of 20 ohms and 25 ohms respectively are in parallel supplying a total load of 25 KW. How do they share the load?
6. (a) Define torque. Derive the expression for torque developed by a DC motor from fundamentals.
(b) A 6-pole, lap wound 400 V series motor has the following data: No. of armature conductors is 920, flux per pole is 0.045 Wb, total motor resistance is 0.6 ohm, iron and frictional losses is 2 KW. If the current taken by the motor is 90 A, find: (i) total torque (ii) useful torque at the shaft (iii) power output (iv) pull at the rim of the pulley of 40 cm diameter connected to the shaft.
7. (a) With a neat diagram explain the construction and working of 3-point stator.
(b) In a 230 V, 10 KW DC shunt motor, it is required that the starting armature current should not exceed twice its rated armature current. During the starting of the motor, the starting resistance is cut out in steps, as soon as the armature current drops to its rated value. The field resistance is 115 ohms and the total armature circuit resistance is 0.348 ohms. Neglect armature inductance. (i) Find the external resistance required at the time of starting the motor. (ii) Determine the value of the first resistance element that must be cut out, when the armature current drops to rated value. (iii) Find the external resistance to be cut out in the second step.
8. What is Hopkinson's test? Why it is called regenerative test? Draw connection and procedure to conduct this test? What are the advantages and disadvantages of this method?
