

II B.Tech I Semester Supplementary Examinations, November 2005
ELECTRO MECHANICS-I
(Electrical & Electronic Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Describe the principle of energy conversion. From the consideration of various energies included, develop the model of an electromechanical energy conversion device. [16]
2. Draw the winding diagram in radial form for a 4-pole 13-slot simplex wave connected d. c. generator with commutator having 13 segments. The no. of coil sides per slot is 2. Indicate the position of brushes. [12+4]
3. (a) Explain the effects of armature reaction in a d. c. generator and discuss briefly the methods to minimize these effects.
 (b) With a neat sketch explain the function of commutator in a d.c. machine. [6+4]
4. Two d.c. compound generators, A and B with an equalising bar, supply a total load of 500A. The data relating to the machine are as follows.
 Armature resistance, $R_A = 0.05 \text{ ohm}$, $R_B = 0.03 \text{ ohm}$
 Series field winding $R_{SA} = 0.02 \text{ ohm}$, $R_{SB} = 0.01 \text{ ohm}$
 Generated emf $E_A = 463\text{V}$, $E_B = 470\text{V}$.
 Calculate
 (a) The current in each armature.
 (b) The current in each series winding.
 (c) The current in the equalising bar and
 (d) The bus-bar voltage.
 Neglect the shunt currents and state the necessary assumptions made, if any. [4*4]
5. (a) Discuss armature reaction and commutation in a dc motor.
 (b) A 230V DC shunt motor takes 32A at full load. Find the back emf on full load if $R_a = 0.2\Omega$ and $R_f = 115\Omega$ respectively. [8+8]
6. (a) What are the different methods of speed control of DC motor? Explain.
 (b) A 220V DC shunt motor draws a no load armature current of 2.5A when running at 1400rpm. Determine its speed when taking an armature current of 60A if armature reaction weakens the flux by 3%. (Assume $R_a = 0.2\Omega$) [8+8]

7. (a) By conducting load test, how the torque and efficiency of a D.C. series motor can be determined? Explain it with a neat circuit diagram?
- (b) A 250V, 14.92 KW shunt motor has a max. efficiency of 88% and a speed of 700 rpm. when delivering 80% of its rated output. The resistance of its shunt field is 100Ω . Determine the efficiency and speed when the motor draws a current of 78A from the mains.

[8+8]

8. (a) Describe a suitable method for determining the efficiency of a DC compound motor?
- (b) In a retardation test on DC separately excited motor the induced e.m.f in the armature falls from 220V to 190V in 30 seconds disconnecting the armature from the supply. The same fall takes place in 20 seconds if immediately after disconnection armature is connected to a resistance which takes 10A (average) during this fall. Find the stray losses of motor.

[8+8]
