

Code: 9A02308

1

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL MACHINES - I
(Electrical & Electronics Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) What is electromechanical energy conversion?
(b) Develop the block diagram of general electromechanical energy conversion device using energy balance equation.
- 2 (a) Prove that the laminated core reduces eddy current losses.
(b) A 6-pole, dc generator is running at 1500 rpm. It generates 230 V when the useful flux per pole is 0.02 Wb. If the armature has 60 slots, calculate the number of conductors per slot when the machine is (i) lap-wound and (ii) wave-wound.
- 3 Explain in detail the phenomenon of armature reaction in dc generators with the help of neat sketches of flux distribution and flux density waveforms before and after the armature reaction.
- 4 (a) Mention the reasons for compounding dc generator.
(b) A 4-pole, 250 V, dc long-shunt compound generator supplies a load of 10 kW at the rated voltage. The armature, series-field and shunt-field resistances are 0.1 Ω , 0.15 Ω and 250 Ω respectively. The armature is lap-wound with 50 slots each slot containing 6 conductors. If the flux per pole is 50 mWb, calculate the speed of the generator.
- 5 (a) Distinguish between external and internal characteristics of dc generators.
(b) Draw the load characteristics of a separately-excited dc generator and explain.
- 6 A 10 kW, 200 V, dc series motor runs at 900 rpm when operating at its full-load. The motor resistance is 0.4 Ω and magnetic circuit can be assumed unsaturated. What will be the speed if
(a) The load torque is increased by 75 %.
(b) The motor current is reduced to half of the full-load value.
- 7 (a) Distinguish between 3-point and 4-point starters.
(b) Explain the functions of NVC, OLR and 'Copper Strip' in a 3-point starter.
- 8 A 500 V dc motor takes a current of 5 A on no-load. The resistance of the armature and field circuits are 0.22 Ω and 250 Ω respectively. Estimate the efficiency when the motor current is 100 A. What is the percentage change of speed between no-load and full-load?
