Code No: R5210206 **R5**

II B.Tech I Semester(R05) Supplementary Examinations, May/June 2010
ELECTRICAL MACHINES - I
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Give applications of singly excited system and explain their working.
   (b) A U shaped lifting magnet made of cast steel is wound with an exciting coil of 800 turns. It is required to lift a mass of 160 kg in air at a distance of 0.1 mm. The magnetic path length of magnet is 75 cm with a cross sectional area of 6 cm^2. Neglect the resistance of coil.. Calculate the minimum current required to lift the weight. The B-H curve data is as follows.
   B = 1.81 1.82 1.83 wb/m^2
   H = 2800 3000 3500 AT/m. [8+8]

2. Design a wave winding for 25 slots, 6 poles DC machine. Show brush position. (Simplex double layer winding). [16]

3. (a) Explain about demagnetizing Ampere turn per pole and Cross magnetizing Ampere Turn per pole.
   (b) What is the purpose of compensating winding? Explain in detail. [8+8]

4. What is critical field resistance? How do you draw the open circuit characteristic in laboratory. [16]

5. (a) Discuss in detail the characteristics and applications of DC Shunt, series and compound generators
   (b) Explain the conditions necessary for the parallel operation of DC generators. [10+6]

6. (a) Define torque. Derive from first principles, the torque equation of a DC motor.
   (b) Determine the torque developed when a current of 30A passes through the armature of a motor with the following particulars: wave winding, 310 conductors, 4-pole, pole-shoes 16.2 cm long subtending an angle of 60^0 at the centre, bore radius 16.2 cm, flux density in air gap 0.7 tesla. [8+8]

7. (a) Compare the speed control of DC motor by rheostat control method and speed control by semi-conductor devices.
   (b) A DC shunt motor is required to supply a load requiring a constant torque of 120 Nm, over a speed of 500 to 2000 RPM.
      i. Explain the three methods of obtaining the required speed range.
      ii. For each method above specify the base speed and power rating. [8+8]

8. (a) A DC motor is fed from a constant voltage supply runs at 900 RPM. At this speed hysteresis loss is 70 W and eddy current loss is 40 W. If the motor speed is increased to 1000 RPM by reducing the flux, calculate the new core loss. Take Steinmitz's constant as 1.6 and neglect armature circuit resistance.
   (b) Explain different iron losses. How these losses can be reduced. [10+6]

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