Code No: NR210205 **NR**

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

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Describe singly excited magnetic field systems.
   (b) The magnetic flux density on the surface of an iron face is 1.6 T, which is a typical saturation level value for ferromagnetic material. Find the force density on the iron face. Derive the formula used.

2. A 4-pole wave connected armature has 51 slots. Draw a developed winding diagram and show the brush positions. Assume any other data required.

3. (a) When are dummy coils used and which type of D.C. armature winding these will occur?
   (b) Calculate the ampere turns for each commutating pole of an 8-pole generator with 107 slots, each containing 1000 ampere conductors. The interpole air-gap is 1.2 cm. The flux density in the air gap is to be 0.32 T. Neglect iron parts and leakage.

4. Sketch neat graphs to show the internal and open-circuit characteristics of separately-excited d.c. generator. Why is a field regulator necessary with such a machine?

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.

6. (a) What is the power flow diagram of DC motor? And explain about losses involved in each stage?
   (b) A 4-pole 120KW, 240V, 800rpm wave wound generator has shunt field current of 4A at rated voltage. The generator has the following data.
   Armature winding single turn coils
   Length of conductors (including over hang) = 0.48 m
   Number of conductors = 480 : Voltage drop/brush = 1 volt
   Cross sectional area of conductors = 25 mm^2
   Full load temperature = 60^0C : Commutator diameter = 0.6 m
   Specific resistance of copper at 20^0C = 1.725×10^{-2} $\Omega/m/mm^2$ Find
      i. Full - load armature copper loss
      ii. Shunt field copper loss, and
      iii. Brush contact loss

7. (a) Why is a starter necessary for a DC motor? Explain the working of a 3-point starter with the help of a neat diagram.

(b) Develop the general expression for the speed of a motor in terms of supply voltage, armature resistance and flux per pole.

8. (a) Explain the three efficiencies of a DC generator showing the inter relation ship among them.

(b) Calculate the efficiency of a 500V shunt motor, when taking 700A, from the following data recorded when the motor was hot, motor stationary: voltage drop in the armature winding15V, armature current 510A, field current 9A at normal voltage. Motor running at normal speed unloaded; armature current 22.5A, applied voltage 550V. Allow 2V for brush contact drop and 1% of the rated output of 400 KW for stray load losses.

⋆ ⋆ ⋆ ⋆ ⋆