

North South University

Midterm Exam, Fall 2020

Course: EEE363

Electrical machines

Full marks: 45

Time: 1 hr. 30 min

Attempt any **THREE** out of four questions. [Figures in the margin denote full marks]

1. (a) What is the purpose of commutator and compensating winding in a DC generator? Can you briefly explain the operation of interpoles? [3+4]

(b) Draw the winding diagram of a simplex 2-layer lap winding for a 4-pole generator with 20 coils. [8]

2. (a) Briefly explain the impact of self-induced emf in a DC generator? What techniques are employed to minimize this impact? What measures are taken to overcome the demagnetizing effect in a generator? [4+2+2]

(b) A DC shunt generator has a full-load current of 196 A at a terminal voltage of 220 V. The stray losses are 690W and the shunt field coil resistance is 55 ohm. The overall efficiency at full-load is 90%. Find (i) armature resistance (ii) constant losses and (iii) the load current corresponding to the maximum efficiency. [2+3+2]

3. (a) Can you point out some differences between a shunt and a series motor? Can you explain analytically what happens to the torque and speed of a motor when the flux is varied? [3+4]

(b) A 6-pole, 500V wave connected shunt motor has 1200 armature conductors and useful flux/pole of 20 mWb. The armature and the resistances are 0.50 ohm and 250 ohm respectively. What will be the speed and the torque developed by the motor when it draws 20A from the supply mains. If the magnetic and mech. losses amount to 900 W, find the efficiency of the machine for this load. [3+3+2]

4. (a) Define critical resistance for a shunt generator. Can you describe the electronic speed control mechanism of a DC motor involving Thyristor and DIAC? [2+5]

(b) What is 'back emf'? Briefly explain its role in the performance of DC motor. [8]