

# North South University

Midterm Exam, Summer 2020

Course: EEE363

Electrical machines

Full marks: 45

Time: 1 hr. 25 min

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

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

(b) Can you briefly describe the procedure for paralleling a shunt generator with another of the same size? Also, show with suitable diagram, how load sharing between two generators operating in parallel takes place? [5+2]

2. (a) Briefly explain 'armature reaction' and its effect with the help of suitable diagram. [7]

(b) Two shunt generators operating in parallel delivering a total load current of 240 A. One of the generators is rated 50 KW and the other 100 KW. The voltage rating of both machines is 500 V and have regulations of 4% and 6% respectively. Assuming linear characteristics, determine (i) the current delivered by each machine (ii) terminal voltage. [4+4]

3. (a) How do you define 'back emf' and speed regulation of a dc motor. Can you explain analytically what happens to the torque and speed of a motor when the flux is varied? [3+4]

(b) A 20 hp, 230 V, 1150 rpm, 4-pole DC shunt motor has a total of 620 conductors arranged in two parallel paths and yielding an armature circuit resistance of 0.20 ohm. When it delivers rated power at rated speed, it draws a line current of 74.8 A and a field current of 3A. Calculate (i) flux per pole (ii) developed torque (iii) total losses (iv) rotational losses. [4x2]

4. (a) Describe various speed control mechanism of DC motor and mention their merits and demerits. [7]

(b) What are the different losses taking place in a DC machine. What techniques are employed to reduce the Iron/Magnetic loss of a DC machine? Briefly state why Iron and Friction losses in a motor take place after Copper loss, whereas in generator we see the opposite order. [2+4+2]