

International Islamic University Chittagong

Department of Electrical and Electronic Engineering

Final Examination Spring-2018

Program: B.Sc. Engg. (EEE)

Course Code: EEE- 2401

Course Title: Electrical Machine-II

Time: 2 hours 30 minutes

Full Marks: 50

Part A

[Answer any two questions from the followings; figures in the right margin indicate full marks.]

- 1(a). What is necessity of parallel operation of alternators? State the conditions necessary for paralleling alternators. 3
- 1(b). Draw and explain the vector diagram when the alternator is loaded with- i) Resistive, ii) Inductive and iii) Capacitive load. 4
- 1(c). A 3 phase, 50 Hz, 8 pole alternator has a star connected winding with 120 slots and 8 conductors per slot. The flux per pole is 0.05 Wb, sinusoidal distributed. Determine the phase and line voltages. 3
- 2(a). Why is synchronous motor not self starting? What methods are generally used to start the synchronous motors? 2
- 2(b). What is synchronous motor V curve? Explain the effect of varying excitation at constant load on synchronous Motor and vice versa. 5
- 2(c). State the applications of synchronous motors. Compare synchronous motor with induction motor drives. 3
- 3(a). Derive maximum power and torque equation for synchronous generator. 2
- 3(b). Draw a block diagram that represents brushless excitation system which includes pilot exciter. 4
- 3(c). A 60kva, 220V, 50 Hz, synchronous motor has armature resistance and armature reactance 0.016ohm, 0.07mho. Compute voltage induced in the armature when it is fully loaded with unity, 0.7 leading, and 0.7 lagging power factor. 4

Part B

[Answer any three questions from the followings; figures in the right margin indicate full marks.]

- 4(a). Write down construction of a PMDC motor. What is the difference between DC shunt motor and PMDC? 3
- 4(b). Why Universal motors are so named. Describe its universality with relevant diagrams. What is the difference between universal motor and DC series motor? 5
- 4(c). A permanent magnet DC motor is rated for 25 V, 2 A and 1300 rpm. If the machine is 90% efficient at rated conditions find R_a and K_v if $T_{mech loss} = 0.0334 N.m$. 2
- 5(a). Describe Half-Stepping operation of Variable Reluctance Stepper Motor with truth table. 3
- 5(b). Describe the basic principle, Construction, and Applications of permanent magnet Synchronous motor. What is the difference between permanent magnet Synchronous motor and Synchronous motor? 5

- 5(c). A stepper motor has a step angle of 2.5° . Determine (a) resolution, (b) number of steps required for the shaft to make 25 revolutions and (c) Shaft speed, if the stepping frequency is 3600pps. 2
- 6(a). Write down the similarities and differences between a 3- ϕ induction motor and a linear induction motor? 2
- 6(b). Draw the circuit diagram for torque transmission by Synchros. 4
- 6(c). What is linear motor? Describe the working principle of linear Induction motor. 4
- 7(a). Describe speed control of universal motors with suitable figure. 3
- 7(b). Describe 2-phase-on modes of operation of permanent magnet stepping motor. Also its advantage & disadvantage. 4
- 7(c). The rotor of control transmitter (CX) is excited by a single phase ac voltage of 20 V (rms). Find the value of E_{1s} , E_{2s} and E_{3s} for rotor angle $\alpha = +40^\circ$ and -40° . 3