International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Semester End Assignment Autumn-2020	Program: B.Sc. Engg. (EEE)
Course Code: **EEE-2401**	Course Title: **Electrical Machine II**
Time: **5 hours** (Writing **4 hours 30 minutes** + **30 minutes** submission time)	Full Marks: **50** (**Written** 30 + **Viva/Viva-Quiz**-20)

[Answer each of the questions **(1-5)** from the followings; Figures in the right margin indicate full marks.**]**

SET-A

1(a).	How does a 3-phase alternator differ from a dc generator? Explain the characteristic feathers of ac armature winding of an alternator.	**CO1**	**U,C**	**02**
1(b).	Derive the expression of output power of an alternator and explain its power angle characteristics.	**CO1**	**An,C**	**02**
1(c).	A 3-phase star-connected alternator is rated at 1600 kVA, 13,500 V. The armature effective resistance and synchronous reactance are 1.5Ω and 30Ω respectively per phase. Calculate the percentage regulation for a load of 1280 kW at power factors of (a) 0.8 leading and (b) 0.8 lagging.	**CO3**	**C**	**02**
2(a).	Explain, using phasor diagrams, what happens to a synchronous motor as its field current is varied. Derive a synchronous motor V curve from the phasor diagram.	**CO1**	**C,An**	**03**
2(b).	A 480 V, 400 hp, 0.8pf leading, Δ connected, 60 Hz synchronous motor has a synchronous reactance of 0.6 Ω and a negligible armature resistance. Assume that the motor is lossless; $\|E_A\|$ is directly proportional to the field current I_F, and $\|E_A\| = 480$ V when $I_F = 4$ A. i) If this motor is initially supplying 400 hp at 0.8 pf lagging, what are the magnitudes and angles of E_A and I_A? ii) If $\|E_A\|$ is increased by 30%, what is the new magnitude of the armature current? What is the motor's new power factor?	**CO3**	**E**	**03**
3(a).	Explain the principle of operation of a universal motor. How can it be developed from a DC series motor?	**CO2**	**C**	**02**
3(b).	Using suitable diagrams, show how the direction of rotation of a universal motor is reversed.	**CO2**	**Ap**	**02**
3(c).	What is a brushless dc motor? Make a comparison between brushless dc motor and ordinary dc motor.	**CO2**	**U**	**02**
4(a).	Explain the construction and principle of operation of stepper motor. What are the main features of stepper motor which are responsible for its wide spread use?	**CO2**	**C**	**03**
4(b).	What is the origin of the name hybrid stepper motor? What is the difference between a permanent-magnet type of stepper motor and a reluctance-type stepper motor?	**CO2**	**U**	**02**
4(c).	A stepper motor has a step angle of 10° and is required to rotate at 200 rpm. Determine the pulse rate (step per second for this motor.	**CO3**	**C**	**01**

5(a).	What determines the synchronous speed of a LIM? What is the fundamental difference between rotary induction motor and linear induction motor?	**CO2**	**U**	**02**
5(b).	Explain the working principle of a Linear Induction Motor and mention some of its applications.	**CO2**	**C**	**02**
5(c).	The pole pitch of a linear induction motor is 0.5m and the frequency of the applied 3-phase voltage is 50 Hz. The speed of the primary side of the motor is 200 km/h and the developed thrust is 100 kN. Calculate the power developed by the motor and the copper loss in the secondary side.	**CO3**	**Ap**	**02**
6.	Viva/Viva-Quiz: The time of viva/viva-quiz will be declared in google classroom.	**CO**		**20**