

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-B

1(a).	What do you mean by synchronous reactance of an alternator? Explain the effect of load power factor on armature reactance in an alternator.	CO1	R,C	02
1(b).	What is synchronizing? What conditions are necessary for paralleling two synchronous generators?	CO1	R	01
1(c).	A 13.8 kV, 50 MVA, 0.9 pf lagging, 60 Hz, four pole Y-connected synchronous generator has a synchronous reactance of 2.5 and negligible armature resistance. The current of the field circuit is adjustable over the range from 0 to 10 A. The OCC of this generator is shown in Fig. 1 .	CO3	E	03

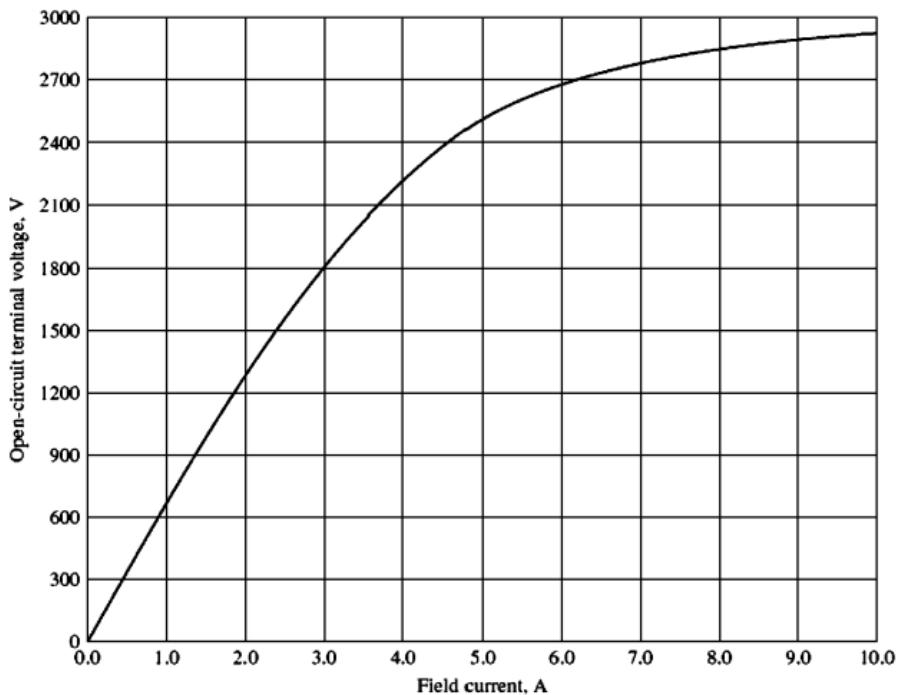


Fig. 1: OCC curve for problem 1(c).

- (i) How much field current is required to make the terminal voltage V equal to 13.8 kV when the generator is running at no load?
- (ii) How much field current is required to make the terminal voltage V equal to 13.8 kV when the generator is running at rated conditions?
- (iii) Suppose that this generator is running at rated conditions, and then the load is removed without changing the field current. What would the terminal voltage of the generator be?

2(a).	Make a comparison between synchronous motor and induction motor.	CO1	U	01
2(b).	Using a phasor diagram, explain how a synchronous motor adjusts its input power to accommodate and increase in shaft load.	CO1	C	02
2(c).	A 208 V, 45 hp, 0.8pf leading, Y connected, 50 Hz synchronous machine has a synchronous reactance of 2.5 Ω and a negligible armature resistance. Its friction and windage losses are 1.5 kW, and its core losses are 1 kW. Sketch the phasor diagram and find the values of I_A , I_L , and E_A for the following cases: <ul style="list-style-type: none"> i. The shaft is supplying a 15 hp load with 0.7 power factor leading. ii. The motor is supplying same load but the motor's flux is increased by 20% iii. The motor is running with the same flux but the motor's load is increased to 25 hp. 	CO3	E	03
3(a).	Using suitable diagrams, explain how the direction of rotation of a universal motor is reversed.	CO2	C	02
3(b).	What changes are necessary in a series dc motor to adapt it for operation from an ac power source?	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).	What is the origin of the name stepper motor? Explain the principle of stepper motor operation. How does it differ in operation from a squirrel-cage induction motor?	CO2	R	03
4(b).	Explain how half-stepping of a stepper motor is accomplished.	CO2	C	02
4(c).	Determine the step angle of a variable-reluctance stepper motor with 12 teeth in the stator and 8 rotor teeth.	CO3	U	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