



Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Summer – 2026

Course Code: 0713-223
Section: A, B, C, D
Full Marks: 40

Course Title: Energy Conversion II
Level-Term: L2-T2
Exam Date: August 19, 2026

Teacher's Initial: NR, RS
Time: 2 Hours

Notes: Answer all the questions below. The second right most column indicates the course outcomes [COs] with respective Bloom's level and the right most column indicates the allocated marks.

- 20
- 2 Q1. Explain the commutation process in a DC generator with necessary illustrative diagrams. CO-1 5
C(2)
- Q2. Briefly describe the followings with necessary curve for series DC motor, CO-1 5
C(2)
(i) Torque versus Armature Current Characteristic
(ii) Speed versus Torque Characteristic
- 3 Q3. Analyze how variations in field current affect the operation of a synchronous motor, and justify your analysis using an appropriate phasor diagram. CO-2 5
C(4)
- 3 Q4. A d.c. shunt machine generates 250-V on open circuit at 1000 r.p.m. Effective armature resistance is 0.5Ω , field resistance is 250Ω , input to machine running as a motor on no load is 4 A at 250 V. Analyze the behavior of the machine by determining the speed as a motor taking 40 A at 250 V. Armature reaction weakens field by 4%. CO-2 5
C(4)
- 21 Q5. A 220-V compound generator is supplying a load of 100 A at 220 V. The resistances of its armature, shunt and series windings are 0.1Ω , 50Ω and 0.06Ω respectively. Evaluate the induced e.m.f. and the armature current when the machine is connected (i) short shunt (ii) long shunt (iii) how will the series amp-turns be changed in long shunt if a divertor of 0.14Ω is connected in parallel with the series windings? Neglect armature reaction and brush contact drop. CO-3 5
C(5)
- 5 Q6. A 4-pole, 250 V d.c. series motor takes 20 A and runs at 900 r.p.m. Each field coil has resistance of 0.025Ω and the resistance of the armature is 0.1Ω . Determine the speed that run the motor by developing the same torque if:
(i) rearranging the field coils in two series and parallel groups
Assume unsaturated magnetic operation. CO-3 5
C(5)

Q7. A 2300-V 1000-hp 0.8-PF leading 60-Hz two-pole Y-connected synchronous motor has a synchronous reactance of 2.8Ω and an armature resistance of 0.4Ω . At 60 Hz, its friction and windage losses are 24 kW, and its core losses are 18 kW. The field circuit has a dc voltage of 200 V, and the maximum I_F is 10 A. Answer the following questions about the motor, assuming that it is being supplied by an infinite bus. CO-3 5
C(5)

- (i) Evaluate I_A and E_A with angle if this machine operates at unity power factor when supplying full load.
- (ii) Determine the motor's efficiency at full load and unity power factor.
- (iii) If the flux were increased by 2.83 %, calculate the new armature current.

Q8. A 75-kW, 3- ϕ , Y-connected, 50-Hz, 440-V cylindrical rotor synchronous motor operates at rated condition with 0.8 p.f. leading. The motor efficiency excluding field and stator losses is 95% and $X_s = 2.5 \Omega$. CO-3 5
C(5)

Evaluate:

- i. mechanical power developed
- ii. armature current
- iii. back e.m.f. $\sqrt{V^2 - I_a^2 X_s^2}$
- iv. power angle
- v. pull-out torque of the motor

Power