



Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Fall – 2025

Course Code: 0713-223

Section: A, B, C

Full Marks: 40

Course Title: Energy Conversion II

Level-Term: L2-T2

Exam Date: December 17, 2025

Teacher's Initial: NR

Time: 2 Hours

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

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|---|--------------|---|
| Q1. Illustrate the constructional arrangement of different types of DC generators with their circuit diagrams and the voltage and current equations associated with each type. | CO-1
C(2) | 5 |
| Q2. Briefly describe the followings with necessary curve for series DC motor,
(i) Electrical Characteristic
(ii) Mechanical Characteristic | CO-1
C(2) | 5 |
| 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
C(4) | 5 |
| Q4. Analyze the commutation process in a DC generator with necessary illustrative diagrams. Also, examine the causes of sparking or fire in commutators. | CO-2
C(4) | 5 |
| Q5. A shunt generator has a full load current of 196 A at 220 V. The stray losses are 720 W and the shunt field coil resistance is 55 Ω . If it has a full load efficiency of 88%, evaluate the armature resistance. Also, evaluate the load current that corresponds to maximum efficiency. | CO-3
C(3) | 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 0.025 ohm and the resistance of the armature is 0.1 ohm. 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
C(3) | 5 |
| Q7. A d.c. shunt machine generates 250-V on open circuit at 1000 r.p.m. Effective armature resistance is 0.5 Ω , field resistance is 250 Ω , input to machine running as a motor on no load is 4 A at 250 V. Calculate speed of machine as a motor taking 40 A at 250 V. Armature reaction weakens field by 4%. | CO-3
C(3) | 5 |

$$N_1 = 1036 \text{ rpm}$$

$$N_2 = 961 \text{ rpm}$$

Q8. 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
C(5)

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.