Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
Mid-Term Examination, Spring – 2026

Course Code: **0713-213** Course Title: Energy Conversion I
Section: A/B/C/D Level-Term: L2-T1 Teacher's Initial: DRA / PA
Full Marks: 25 Exam Date: February 22, 2026 Time: 1.5 Hours

Attempt to Answer all 3 Questions

Q1. a) **Draw** the phasor diagram of a capacitively loaded transformer with winding resistance and leakage reactance — **CO-1 C(3)** **[3]**

b) A 25 kVA, 2500/220 V, 50 Hz transformer has a high-voltage winding resistance of 0.15 Ω and a leakage reactance of 0.25 Ω. The low-voltage winding has a resistance of 0.04 Ω and a leakage reactance of 0.016 Ω. **Find** the equivalent winding resistance, reactance and impedance referred to the (i) high-voltage side and (ii) the low-voltage side and (iii) total Cu loss of the transformer. — **CO-1 C(3)** **[4]**

Q2. a) '*A transformer with magnetic leakage is equivalent to an ideal transformer with inductive coils connected in both primary and secondary side*'- **Justify** this statement with necessary detailing. — **CO-1 C(2)** **[3]**

b) A 15 kVA, 450/150 V, 50 Hz transformer is connected to the high-voltage side while the low-voltage side remains open. The transformer draws 0.5 A of current and consumes a power of 25 W. **Calculate** (i) no-load pf angle and pf, (ii) the magnetizing current, (iii) core loss current. — **CO-1 C(3)** **[5]**

Q3. Answer any 2 (Two) from the following questions:

a) The parameters of a 2200/230 V, 50-Hz transformer are given below: R_1= 0.18 Ω; X_1= 0.9 Ω; R_2'= 0.45 Ω; X_2'= 0.5 Ω; R_0= 235 Ω; X_m= 1250 Ω. The secondary load impedance Z= 0.55 + j 0.35 Ω. **Solve** for , , using the exact equivalent circuit with normal voltage applied across the primary. — **CO-2 C(4)** **[5]**

b) A 30 kVA, 2200/240 V, 50 Hz transformer has R_1=25 Ω, L_1=.32 H, R_2=0.05 Ω, X_2=1.27 mH, no-load current of 5 A leading the flux by and delivers full-load secondary current of 125 A at 200 V with a power factor of 0.85 lagging. **Calculate** (i) the supply voltage (ii) the overall power factor and (iii) draw the associated vector diagram. — **CO-2 C(4)** **[5]**

c) **Obtain** the equivalent circuit of a 230/400-V, 50-Hz, single-phase transformer from the following test data : — **CO-2 C(4)** **[5]**
O.C test : 230 V, 0.8 A, 60 W – on L.V. side
S.C. test : 12 V, 10 A, 115 W – on H.V. side
Calculate the secondary terminal voltage when delivering 5 kW at pf 0.85 lagging, the primary voltage being 230V.

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