Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
Mid-Term Examination, Spring – 2025

Course Code: **0713-213** Course Title: Energy Conversion I
Section: A / B / C Level-Term: L2-T1 Teacher's Initial: DRA
Full Marks: **25** Exam Date: March 11, 2025 Time: ***1.5 Hours***

Attempt to Answer all 4 Questions

Q1.	**a)**	**Derive** the EMF equation of a single-phase transformer.	**CO-1 C(3)**	**3**
	b)	A 25 kVA, 230/11000 V single-phase, 50 Hz transformer has 2400 turns in its high voltage side winding. **Calculate** (i) full-load primary and secondary currents, (ii) the number of turns in its low-voltage side and (iii) the maximum flux in the iron core.	**CO-1 C(3)**	**4**
Q2.	**a)**	**Describe** with supporting figures that whatever the load conditions, the net flux passing through the core is approximately the same as at no-load.	**CO-1 C(2)**	**3**
	b)	A single-phase transformer has 75 turns in secondary and 320 turns in primary. The no-load power factor is 0.1736 lagging and the magnetizing component of no-load primary current is 4.7 A. If the load component of primary current (I_2') is 35 A at 0.891 lagging. **Determine** the no-load current (I_0) and the current delivers by secondary (I_2).	**CO-1 C(3)**	**4**
Q3.	**a)**	**Explain** - how the exciting circuit components are measured using open-circuit test of a transformer. Provide free-hand drawing and associated equations.	**CO-2 C(2)**	**2**
	b)	A 20 kVA, 2200/240 V, 50 Hz transformer has a high-voltage winding resistance of 0.15 Ω and a leakage reactance of 0.35 Ω. The low-voltage winding has a resistance of 0.04 Ω and a leakage reactance of 0.015 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-2 C(5)**	**4**
Q4.		A 25 kVA, 2300/240 V, 50 Hz transformer has R_1=25 Ω, X_1=110 Ω, R_2=0.05 Ω, X_2=0.4, no-load current of 4.5 A leading the flux by 25^0 and delivers full-load secondary current of 130 A at 240 V with a power factor of 0.85 lagging. **Calculate** the supply voltage.	**CO-2 C(5)**	**5**