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Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Mid-Term Examination, Fall – 2025

Course Code: 0713-213
Section: A, B, C, D, E
Full Marks: 25

Course Title: Energy Conversion I
Level-Term: L2-T1
Exam Date: October 11, 2025

Teacher's Initial: DRA, BS
Time: 1.5 Hours

Attempt to Answer all 4 Questions

Q1.	a)	**Derive** the EMF equation of a single-phase transformer with supporting diagram.	CO-1 C(2)	3
	b)	A single-phase transformer has a primary winding of 1000 turns and a secondary winding of 280 turns. The load current on the secondary is 60 A at pf 0.707 lagging and the primary current is 30 A at pf 0.85 lagging. **Determine** the no-load current and the no-load power factor of the transformer.	CO-1 C(3)	4
Q2.	a)	"Whatever the load conditions, the net flux passing through the core is approximately the same as at no-load"- **Justify** the statement with necessary figures.	CO-1 C(2)	3
	b)	A 50 kVA, 4,400/200-V, 50-Hz transformer has a high voltage winding resistance of 0.12 Ω and a leakage reactance of 0.222 Ω. The low voltage winding resistance is 0.035 Ω and the leakage reactance is 0.012 Ω.	CO-1 C(3)	4
		i) **Determine** the equivalent winding resistance, reactance and impedance referred to the high voltage side and the low-voltage side.		
		ii) **Calculate** the total Cu loss of the transformer.		
Q3.	a)	**Sketch** the vector diagram of a transformer connected at lagging load considering both winding resistance and leakage reactance.	CO-2 C(3)	2
	b)	**Find** the equivalent circuit parameters of a 10 kVA, 240/400 V, 50 Hz, single-phase transformer was tested with the following results: O.C. Test : 240 V, 1.2 A, 90 W – on LV side S.C. Test: 15 V, 4.7 A, 110 W – LV side is shorted **Calculate** the output secondary voltage of the transformer when delivering a load of 1 kW at pf 0.85 lagging and the primary is supplied at 240 V.	CO-2 C(5)	4

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Q4. The following data refer to a single-phase transformer: Turn ratio 20 : 1; $R_1 = 30\ \Omega$; $X_1 = 100\ \Omega$; $R_2 = 0.08\ \Omega$; $X_2 = 0.3\ \Omega$. No-load current = 1.8 A leading the flux by 25°. The secondary delivers 200 A at a terminal voltage of 520 V and p.f. of 0.8 lagging. Determine the primary induced e.m.f and primary current. CO-2 C(3) 5

OR

A-100 kVA transformer has 450 turns on the primary and 80 turns on the secondary. The primary and secondary resistances are 0.35 Ω and 0.01 Ω respectively and the corresponding leakage reactances are 1.3 and 0.035 Ω respectively. The supply voltage is 2100 V. Calculate (i) equivalent impedance referred to primary and (ii) the voltage regulation and the secondary terminal voltage for full load having a power factor of 0.9 leading. CO-2 C(3) 5