Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Spring-2026

Course Code: 0713-121 | Course Title: Electrical Circuits II | Teacher's Initial: MSA, KMT, KNA
Section: A, B, C, D, E, F, G | Level-Term: L1-T2 | Time: 2 Hours
Full Marks: 40 | Exam Date: April 25, 2026

Question no. 1 is COMPULSORY. Answer ANY FOUR from the remaining Questions.

Q1. The switch in the circuit of Fig. 1 closes at t = 0, after being open for a long time. **Calculate** the transient current $i_3(t)$, if $V_s = 120\sqrt{2}\ \cancel{sin}\ sin\ (100\pi t + 30°)$ V. CO-3 C(3) 8

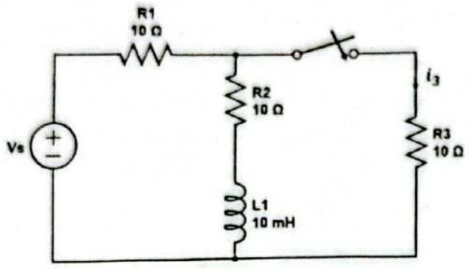

Fig. 1

Q2. The energy stored in the coupled inductors of the circuit diagram shown in Fig. 2 is given by $\frac{1}{2}L_1 i_1^2 + \frac{1}{2}L_2 i_2^2 - M i_1 i_2$. **Derive** an expression for the maximum possible value of M from the limiting value of the energy, and define *coupling coefficient* (k) from your derived expression. What is the range of coupling coefficient? CO-2 C(2) 8

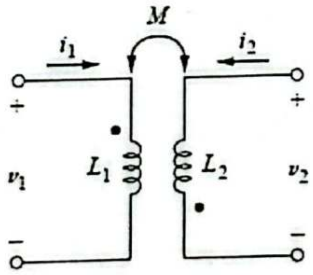

Fig. 2

Q3. **Explain** mathematically what type of filter the circuit in Fig. 3 works as. **Illustrate** the ideal and actual frequency response of the corresponding filter, labeling important point(s). CO-2 C(2) 8

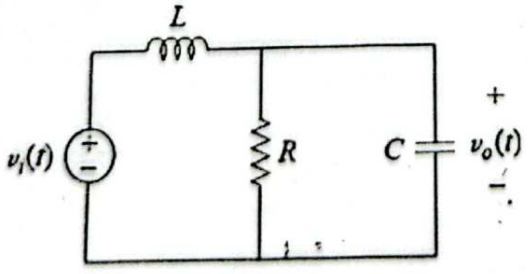

Fig. 3

Q4. **(a)** In a parallel RLC resonance circuit, $R = 8\ k\Omega, L = 0.2\ mH, C = 8\ \mu F$. **Calculate** ω_0, B, Q, ω_1, and ω_2. CO-2 C(3) 4

(b) A designer has to design a bandstop filter that will reject a 200 Hz sinusoid while allowing other frequencies to pass. The required bandwidth of the filter is 100 Hz, and the only available resistor has a value of 150 Ω. **Draw** a suitable circuit that can achieve the required specification using passive components (L and C), and **determine** the values of all necessary components required for the design. 4

Q5. **(a)** For the Δ-Δ circuit in Fig. 5, **determine** the phase currents, line currents, and total power absorbed by the load. CO-2 C(3) 4

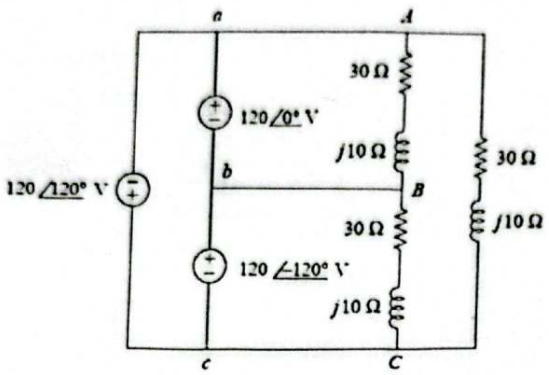

Fig. 5(a)

(b) A three-phase Y-connected motor draws 5.6 kW when the line voltage is 220 V and the line current is 18.2 A. Determine the power factor, reactive power, and complex power absorbed by the motor. 4

Q6. Determine the currents i_1, and i_2 in the circuit of Fig. 6. **Calculate** the energy stored in the coupled coils at time $t = 1s$, if $v_s = 120\ cos\ \cancel{cos}\ 10t$ V. CO-2 C(3) 8

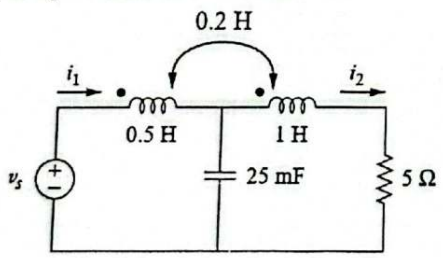

Fig. 6

Q7. The unbalanced Δ-load of Fig. 7 is supplied by balanced line-to-line voltages of 240 V in the positive sequence. CO-2 C(3) 8

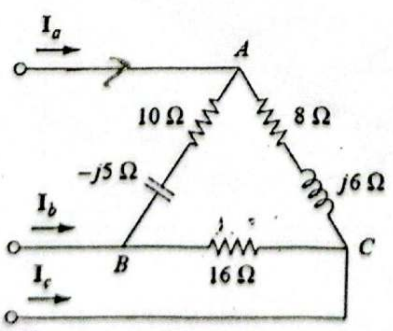

Fig. 7

(a) Find the line currents I_a, I_b, and I_c.

(b) Compute the total power absorbed by the load.