Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Spring – 2025

Course Code: 0713-121 | Course Title: Electrical Circuits II
Section: A, B, C, D, E, F | Level-Term: L1-T2 | Teacher's Initial: MSA, SZE
Full Marks: 40 | Exam Date: March 21, 2025 | Time: 2 Hours

Question No. 1 and 2 are COMPULSORY. Answer any 3 (THREE) from the rest of the Questions

Q1. (a) **State** Thevenin's Theorem. **Derive** the condition for maximum power transfer in Thevenin's equivalent circuit. CO-2 C (3) [04+04 = 08]

(b) **Find** Norton's impedance and current of the circuit in Figure 1(b)

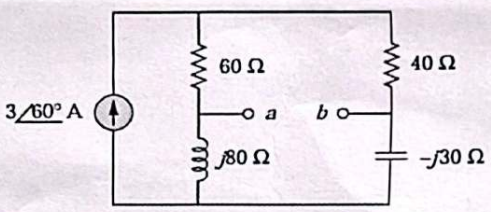

Figure: 1(b)

Q2. (a) **Identify** the type of filter the circuit in Figure 2(a) works as. **What** will be the corner frequency if R1= 200 Ω, R2= 70 Ω and L= 0.1 H. CO-3 C (6) [04+04 = 08]

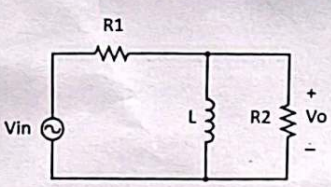

Figure: 2(a)

(b) The Quality factor of a band-pass filter circuit is 20. If the resonant frequency of the circuit is 3 kHz, then **design** the circuit with appropriate values of R and C. Note that inductance, L = 0.1 H

Q3. **(a) Show** that the summation of balanced three-phase voltages is zero. CO-2 [02+06
(b) Calculate v_o of the circuit in Figure 3(b). C (3) = 08]

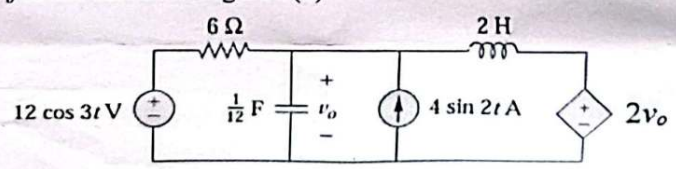

Figure: 3(b)

Q4. (a) **Sketch** the ideal and actual frequency response of a band-stop filter circuit with proper labeling. CO-2 C (3) [02+06 = 08]

(b) **Calculate** the line currents and total complex power of the load of the 3-phase unbalanced circuit given in Figure 4(b). The circuit is operating in abc sequence $V_{an} = 220\angle 0°$ V.

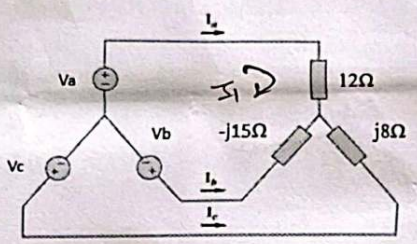

Figure: 4(b)

Q5. (a) **State** Kirchhoff's Current Law with an example. CO-2 C (3) [02+02 +04=08]

(b) **Derive** the relation between line current and phase current in a delta-connected system.

(c) **Compute** V_o of the circuit in Figure 5(c) using Nodal Analysis.

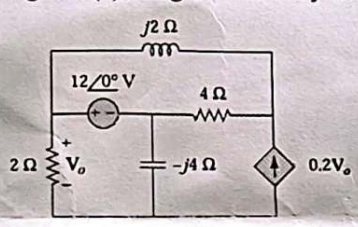

Figure: 5(c)

Q6. (a) In a balanced Δ-Y circuit, $V_{ab} = 150\angle 30°$ and the per-phase impedance, $Z_Y = (3 - j6)\ \Omega$. **Find** the line voltages, line currents, total power, and power factor of the system if the circuit operates in negative sequence. CO-2 C (3) [04+04 = 08]

(b) A three-phase Δ-connected motor takes 10KVA power with 0.75 power factor (lagging). The motor is connected to a Y load of 10Ω resistance and 18Ω capacitive reactance connected in series in each phase. **Calculate** the total Volt-Amperes, power factor, and line current of the circuit.

Q7. (a) **Show** that in a three-phase system, $Z_\Delta = 3Z_Y$. CO-2 C (3) [02+06 = 08]

(b) Use Mesh Analysis to find the current I_o flowing in the circuit in Figure 7(b).

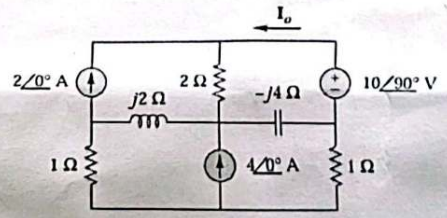

Figure: 7(b)