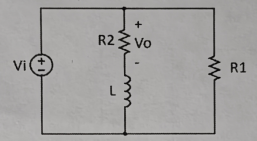
Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Fall – 2024

Course Code: 0713-121 | Course Title: Electrical Circuits II
Section: A, B, C | Level-Term: L1-T2 | Teacher's Initial: MSA, SZE
Full Marks: 40 | Exam Date: December 18, 2024 | Time: 2 Hours

Taking at least TWO from each section, answer FIVE of the following questions.

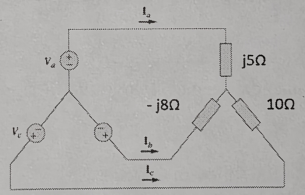
Section A

Q1. (a) **Determine** the type of filter the following circuit works as. Find the corner frequency if R1 = 200Ω, R2 = 100Ω and L = 2mH. CO-3 (C5) [04]



(b) A band Stop Filter circuit's rejection frequency is 1000 Hz, and the rejection bandwidth is 500 Hz. if L = 0.1H, **design** the circuit with suitable values of R and C. (C6) [04]

Q2. (a) **Compute** the phase currents of the following 3-phase unbalanced circuit operating in abc sequence if V_{an} = 120 V. CO-2 (C3) [06]



(b) **Calculate** the total complex power of the load. [02]

Q3. (a) **Show** that for a three-phase balanced load, $Z_\Delta = 3Z_Y$. CO-2 (C3) [02]

(b) For a 3-phase Y-connected source, **prove** that $V_L = \sqrt{3}V_P\angle 30°$. [02]

(c) In a 3-phase negative sequence balanced Y-Δ circuit, $V_{an} = 100\angle 0°$ and the per phase impedance, $Z_\Delta = (12 - j6)\ \Omega$. **Compute** the line voltages, line currents, total power, and power factor of the system. [04]

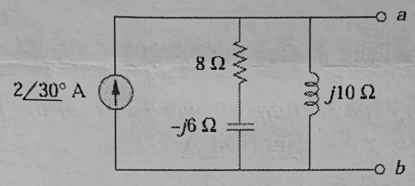
Q4. (a) **Demonstrate** the expression of resonant frequency (ω_0) in an R-L-C series resonant circuit. **Sketch** the frequency response of the circuit with proper labelling. CO-3 (C3) [03]

(b) A three-phase Δ-connected motor takes 20KVA power with 0.6 power factor (lagging). The motor is connected to a Y load of 15Ω resistance and 12Ω inductive reactance connected in series in each phase. **Calculate** the total Volt-Amperes, power factor, and line current of the circuit. CO-2 (C3) [05]

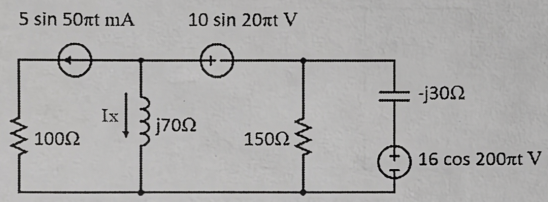
Section B

Q5. **(a)** **Show** that in a Thevenin's equivalent circuit, maximum power is attained if the load impedance, $Z_L = Z_{th}^*$ where, Z_{th} = Thevenin's equivalent impedance. CO-2 (C3) [04]

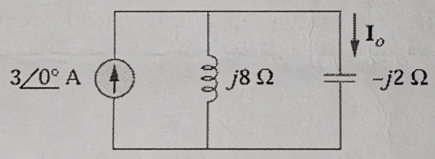
(b) **Compute** the Thevenin's equivalent of the circuit. **What** is the maximum power of the load? [04]



Q6. **(a)** **Write** the expression of I_x of the following circuit. CO-2 (C3) [05]

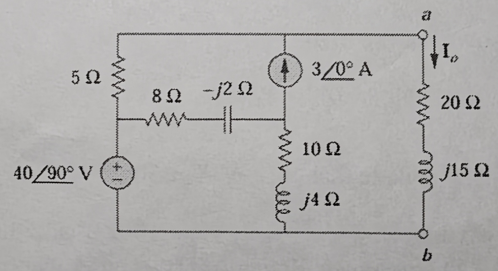


(b) **Determine** I_o of the following circuit using Mesh analysis. (C5) [03]



Q7. **(a)** **What** do you understand by a sinusoidal signal? **Prove** that a signal's RMS value is always greater than the AVERAGE value. CO-2 (C1) [03]

(b) **Calculate** the Norton's equivalent of the following circuit. (C3) [05]



Q8. **(a)** **Use** nodal analysis to find I_x of the following circuit. CO-2 (C3) [08]