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Name of the Program: B. Sc. in EEE
Semester: 2nd Semester

Date: March 05, 2024
Time: 10:00 am – 11:30 am

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination
Course No.: EEE 4201
Course Title: Electrical Circuit II

Summer Semester, A.Y. 2022 – 2023
Time: 90 Minutes
Full Marks: 75

There are 6 (six) questions. Answer all 6 (six) questions. The symbols have their usual meanings. Marks of each question and corresponding COs and POs are written in the brackets. Programmable calculators are not allowed. Do not write on this question paper. Assume suitable values for any missing data.

1. Analyze the different circuit theorems and techniques which can be used to solve the circuit in Fig. 1. After a thoughtful consideration, fill out for the contents of Table 1 for finding out I_0 in the most efficient way possible. (20)
(P01)
(C01)

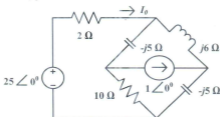


Fig. 1

Table 1

Contents	Your Answer
Preferred circuit theorem/technique:	
Reasons behind choosing the preferred circuit theorem/technique:	i)
	ii)
	iii)
Number of variables in your proposed circuit theorem/technique:	
Simplified equations to be solved for calculating the variables:	
Value of I_0 :	

2. Analyze the properties of series RL and RC circuits under a sinusoidal excitation. Based on your understanding, fill out the contents of Table 2. (15)
(P01)
(C01)

Table 2

Contents	Your Answer
A circuit that generates 90°(leading) phase shift:	
Ratio of V_{out} to V_{in} for the proposed circuit:	
Ideal V_{out} to V_{in} ratio and techniques implemented in achieving it:	

3. A 3- ϕ induction motor is connected to a 3- ϕ power distribution system. The motor is fed by a balanced wye-connected voltage source with $V_{an} = 10\angle 0^\circ$ and has a balanced load with per-phase impedance of $Z_p = 2\sqrt{3}\angle 15^\circ$. Analyze this system and fill out the contents of Table 3. (15)
(PO1)
(CO1)

Table 3	
Contents	Your Answer
Amplitude of phase currents:	
Amplitude of line currents:	
Amplitude of phase voltages:	
Amplitude of line voltages:	
Phasor diagram of all voltage and current signals:	

4. The following three parallel-connected three-phase loads are fed by a balanced 3- ϕ wye-connected source with a line voltage of 13.8 kV. (10)
(PO1)
(CO1)
- Load 1: 250 kVA, 0.80 pf (lagging)
Load 2: 300 kVA, 0.95 pf (leading)
Load 3: 450 kVA, unity pf
- Calculate the line current and power factor of the source (assume the line impedance is zero).
5. Given that $v(t) = 5 \cos(\omega t)$ and $i(t) = 4 \cos(\omega t - 30^\circ)$. (10)
(PO1)
(CO1)
- i) Sketch for $v(t)$ and instantaneous power $p(t)$ on a graph paper.
ii) Dissect different regions of $p(t)$ and interpret their existences.
6. Find the value of the parallel capacitance/inductance needed to improve the power factor (pf) of a 130 kVAR, 0.85 pf (leading) load to unity. The supply voltage is X kV. (05)
(PO1)
(CO1)