Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2024

Subject Code:3131103 Date:06-07-2024

Subject Name: Network Theory

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q-1	**(a)**	Discuss the following. (i) Linear and Nonlinear elements (ii) Bilateral and Unilateral elements (iii) Active and Passive elements	**03**
	(b)	Find the total inductance of the three series connected coupled coils as shown in Figure 1.	**04**
	(c)	Name the three parameters of electric Network. Discuss the characteristics of each one of them. Write equation for voltage-current and energy relation.	**07**
Q-2	**(a)**	Explain Ideal and Practical energy sources.	**03**
	(b)	Use nodal analysis to find the voltages across the 5Ω resistor in the network as shown in figure 2.	**04**
	(c)	Determine the mesh currents i_1, i_2 and i_3 in a network of figure 3.	**07**
		OR	
	(c)	Determine the values of unknown node-to- reference voltages in the circuit as shown in figure 4.	**07**
Q-3	**(a)**	Explain Why? (i) The current in an inductor cannot change instantaneously. (ii) The voltage across a capacitor cannot change instantaneously.	**03**
	(b)	A series RLC circuit with zero inductor current and zero capacitor voltage is excited by 50V dc source. Find $i(0^+)$ and $\frac{di}{dt}0^+$ for the circuit as shown in figure 5.	**04**
	(c)	Determine the numerical value of i_2 using source transformation method for the circuit given in figure 6.	**07**
		OR	
Q-3	**(a)**	How the following elements will behave at t = 0 and t = ∞. Draw the equivalent network. (i)Resistor (ii)Inductor (iii) Capacitor	**03**
	(b)	In the figure 7, the switch K is closed at t=0, v=100V, R=1KΩ, C=0.5 μF, L=1H. Find (i) $\frac{di}{dt}$ and (ii) $\frac{d^2i}{dt^2}$ at t=0.	**04**
	(c)	For network shown in figure 8, All sources are time invariant. Determine the branch current in 2Ω resistor using source transformation method.	**07**
Q-4	**(a)**	State and explain: Thevenin's theorem in brief by giving suitable example.	**03**
	(b)	What is time constant? Explain time constant in terms of RL circuit.	**04**
	(c)	Determine the current in R=1Ω resistor of the network shown in Figure 9, using Norton's theorem.	**07**
		OR	

Q-4	**(a)**	State and explain: superposition theorem in brief by giving suitable example.	**03**
	(b)	State and explain initial value theorem.	**04**
	(c)	For the circuit shown in figure 10, determine the value of R_L for maximum power transfer. What will be the value of power transfer under this condition?	**07**
Q-5	**(a)**	Determine h-parameters in terms of z-parameters.	**03**
	(b)	Define the terms: (1) Planner graph (ii) Non- Planner graph (iii) Loop	**04**
	(c)	Find z-parameters of the circuit shown in Figure 11.	**07**
		OR	
Q-5	**(a)**	Determine ABCD -parameters in terms of Y-parameters.	**03**
	(b)	Briefly describe the network synthesis and its application.	**04**
	(c)	Determine Y-parameters for the network shown in Figure 12. Calculate Z-parameters from Y-parameters.	**07**

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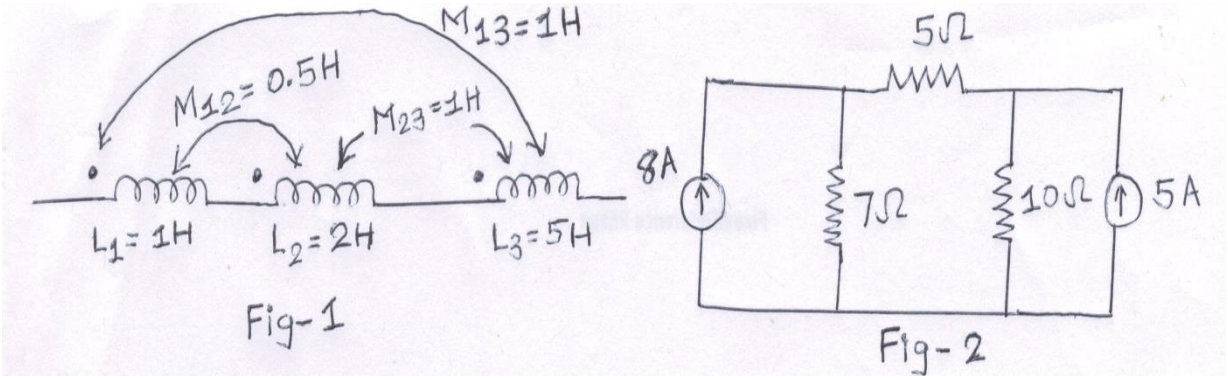
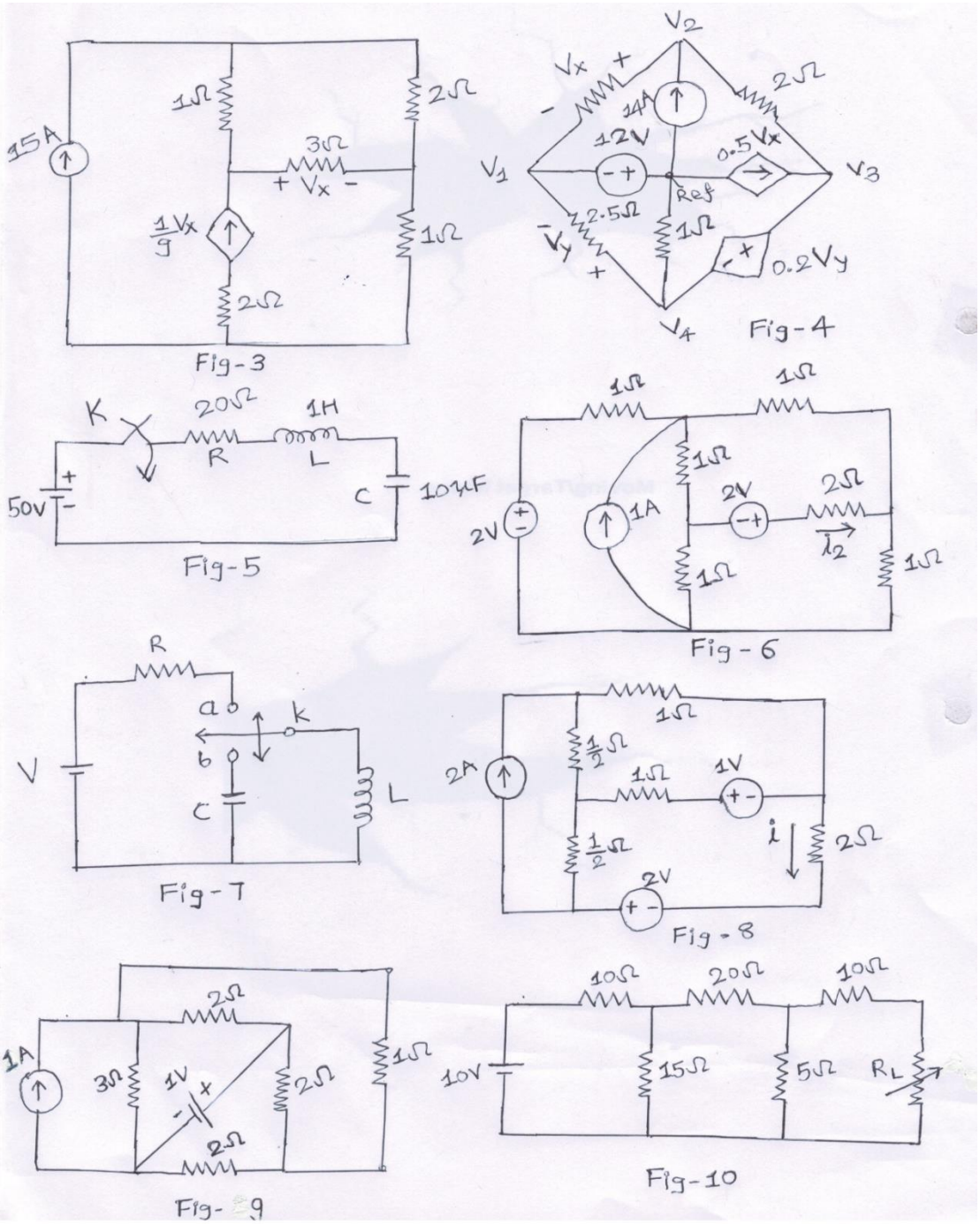


Fig-1

Fig-2


15A
1Ω
2Ω
3Ω
+ Vx −
1/9 Vx
1Ω
2Ω
Fig-3
V2
Vx
+
−
2Ω
14A
12V
0.5Vx
V1
V3
Ref
2.5Ω
1Ω
Vy
+
0.2Vy
V4
Fig-4
K
20Ω
1H
R
L
50V
+
−
C
10μF
Fig-5
1Ω
1Ω
1Ω
2V
2Ω
2V
1A
i2
1Ω
1Ω
Fig-6
R
a
k
b
V
C
L
Fig-7
1Ω
1/2Ω
2A
1Ω
1V
i
1/2Ω
2Ω
2V
Fig-8
2Ω
1A
3Ω
1V
2Ω
1Ω
2Ω
Fig-9
10Ω
20Ω
10Ω
10V
15Ω
5Ω
RL
Fig-10
I1
5Ω
I2
V1
20Ω
15Ω
V2
Fig-11
I1
0.5Ω
1Ω
I2
V1
1Ω
2V1
0.5Ω
V2
Fig-12

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