

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3132406

Date:29-06-2024

Subject Name: Circuit 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.

- Q.1**
- (a) State and explain Kirchoff's Laws. **03**
 - (b) Derive the relationship to express star connected resistance into equivalent delta. **04**
 - (c) Find the current in the 5Ω resistor of the network shown in Fig. 1 using mesh analysis. **07**
- Q.2**
- (a) State Superposition theorem and Reciprocity Theorem **03**
 - (b) Explain maximum power transfer theorem with necessary derivation for condition of maximum power transfer. **04**
 - (c) Find the Thevenin equivalent network of the network to the left of A-B, for the network shown in Fig 2. **07**
- OR**
- (c) Find the current through the 10Ω resistor of the network shown in Fig. 3 using Norton Theorem.
- Q.3**
- (a) State the Initial and final condition of Resistor, Inductor and capacitor. **03**
 - (b) Define Laplace Transform of a function $f(t)$. Explain the advantage of using Laplace transform method. **04**
 - (c) In the network shown in Fig. 4, the switch is closed at $t = 0$, a steady state having previously been attained. Find the current $i(t)$. **07**
- OR**
- Q.3**
- (a) Define the following terms: **03**
 - 1. Poles
 - 2. ZerosTransfer function
 - (b) Obtain the current through the series R-L circuit using Laplace Transform. **04**
 - (c) In the network of Fig. 5, the switch is opened at $t = 0$. Find $i(t)$. **07**
- Q.4**
- (a) Define the following terms: **03**
 - 1. Angular Frequency
 - 2. Time PeriodRMS value.
 - (b) Write mesh equations for the network shown in Fig 6. **04**
 - (c) Find the voltage across the 4Ω resistor in the network of Fig. 7. **07**

OR

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|------------|------------|---|-----------|
| Q.4 | (a) | Find the equivalent inductance of the network shown in Fig 8. | 03 |
| | (b) | Explain inductive coupling in series aiding and series opposition circuit. | 04 |
| | (c) | Find the current through the $3 + j4$ ohm impedance for the network shown in Fig 9 using superposition theorem. | 07 |

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|------------|------------|--|-----------|
| Q.5 | (a) | Derive the condition of reciprocity for ABCD parameters. | 03 |
| | (b) | Explain y parameters in terms of h-parameters. | 04 |
| | (c) | Determine hybrid parameters for the network of Fig. 10. Determine whether the network is reciprocal. | 07 |

OR

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|------------|------------|---|-----------|
| Q.5 | (a) | Derive the condition of symmetry for z parameters. | 03 |
| | (b) | Explain short circuit admittance parameters and draw the equivalent circuit of two port network in terms of Y-parameters. | 04 |
| | (c) | Find the open-circuit impedance parameters for the network shown in Fig. 11. Determine whether the network is symmetrical and reciprocal. | 07 |

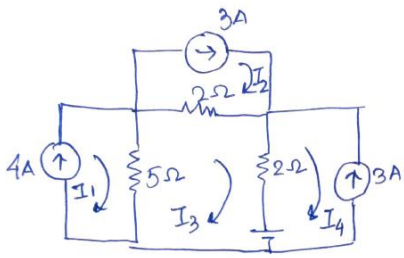


Figure 1

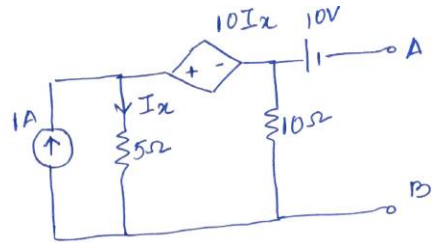


Figure 2

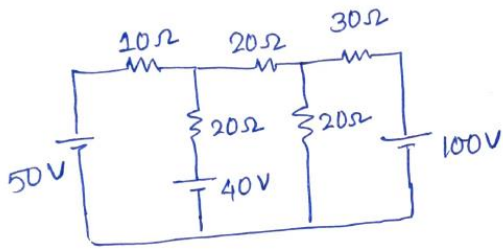


Figure 3

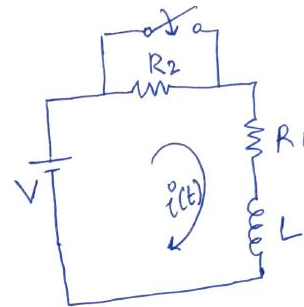


Figure 4

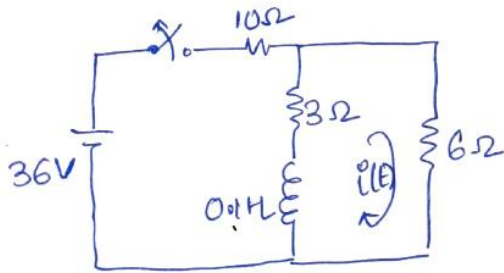


Figure 5

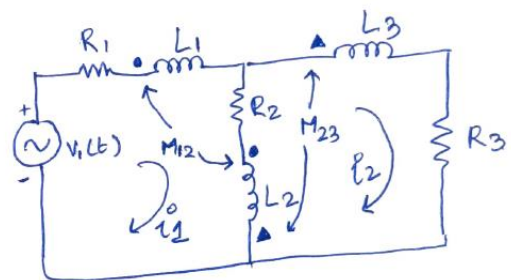


Figure 6

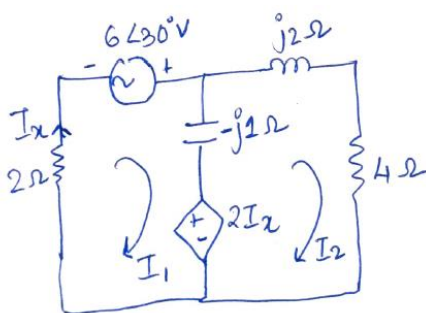


Figure 7

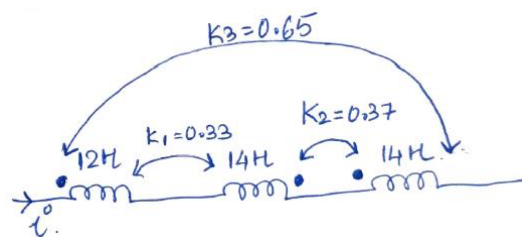


Figure 8

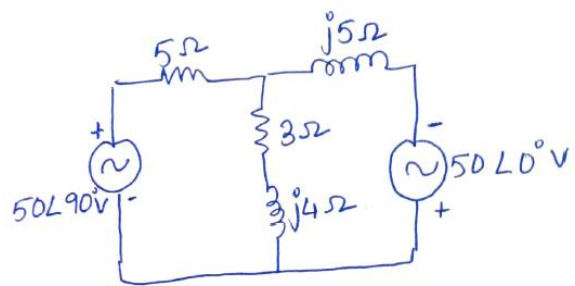


Figure 9

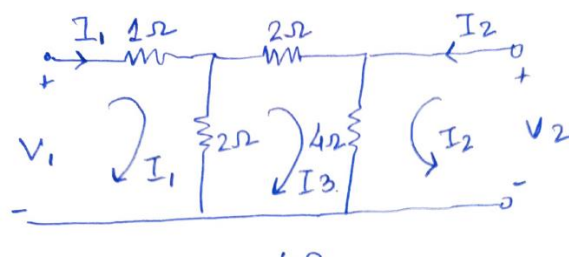


Figure 10

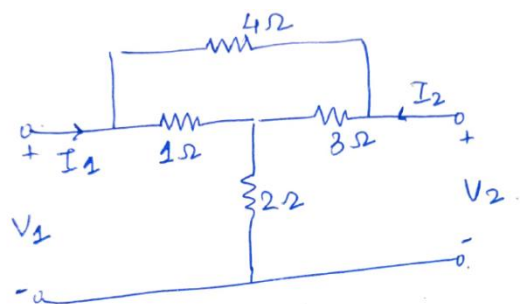


Figure 11