

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– III (NEW) EXAMINATION – SUMMER 2022****Subject Code:3131103****Date:18-07-2022****Subject Name:Network Theory****Time:02:30 PM TO 05:00 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) Determine the Laplace transform of $f(t) = e^{-3t} \sin 5t$. | 03 |
| | (b) How the following elements will behave at $t=0$ and $t=\infty$. Draw equivalent network as well. A) Inductor B) Capacitor. | 04 |
| | (c) Determine the mesh currents i_1, i_2 and i_3 in the network shown in fig.1 using mesh analysis. | 07 |
| Q.2 | (a) Determine z-parameters in terms of y-parameters. | 03 |
| | (b) Define 1) Tree 2) Connected Graph 3) Co-tree 4) Sub-graph | 04 |
| | (c) State and explain maximum power transfer theorem. Also derive the condition for maximum power transfer to the load for DC and AC circuits. | 07 |
| OR | | |
| | (c) For the network shown in fig.2, the capacitor is initially charged to a voltage V_0 , with the polarity indicated on the diagram. The switch is closed at $t=0$. Determine the particular solution for the current in the circuit. | 07 |
| Q.3 | (a) State and explain Superposition theorem. | 03 |
| | (b) Reduce the network of fig.3 into an equivalent network across terminals AB with one equivalent current source. | 04 |
| | (c) In the network shown in fig.4, the switch k is closed at $t=0$. For the element values given, determine the values of $v_a(0^-)$ and $v_a(0^+)$. | 07 |
| OR | | |
| Q.3 | (a) Derive the condition for network to be reciprocal for ABCD parameters. | 03 |
| | (b) Explain characteristic of an ideal current source. | 04 |
| | (c) In the network of Fig.5, the switch k is closed at $t=0$, a steady state having previously been attained. Find the particular solution for the current. | 07 |
| Q.4 | (a) State and explain initial value theorem of Laplace transform. | 03 |
| | (b) Find the Thevenin's equivalent network across A and B terminal for the fig.6 | 04 |
| | (c) Derive relationship between incidence matrix (A), fundamental tie-set matrix (B_f) and fundamental cut-set matrix (Q_f). | 07 |
| OR | | |
| Q.4 | (a) What is network synthesis? | 03 |
| | (b) Obtain step response to R-L series circuit using Laplace Transformation. | 04 |
| | (c) Find the current in the 5ohm resistor using Norton's theorem from the fig. 7 | 07 |
| Q.5 | (a) Determine the inductance of the individual winding shown in fig.8 and the equivalent inductance when mutual inductance is 8H. | 03 |

- (b) Briefly explain Positive Real Function (PRF). 04
 (c) For the network of Fig.9, determine z-parameters. 07

OR

- Q.5** (a) Define fundamental loop and cut-set. 03
 (b) Derive the condition for network to be symmetrical for g-parameters. 04
 (c) Obtain the general solution and the particular solution for the current $i(t)$ in the fig. 10 .Also, obtain the value of current at time $t=0.1$ sec. 07

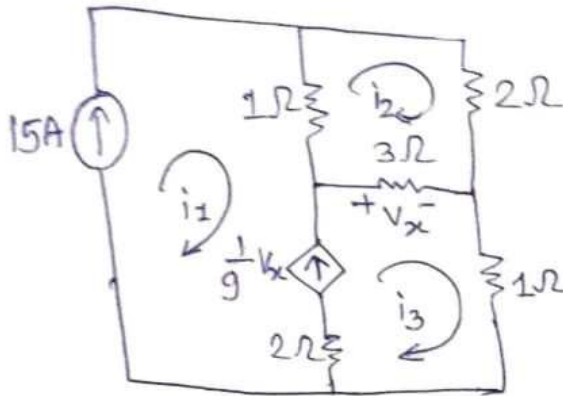


Fig 1.

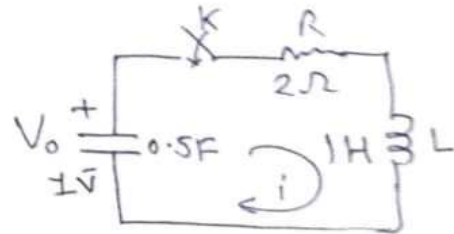


Fig 2

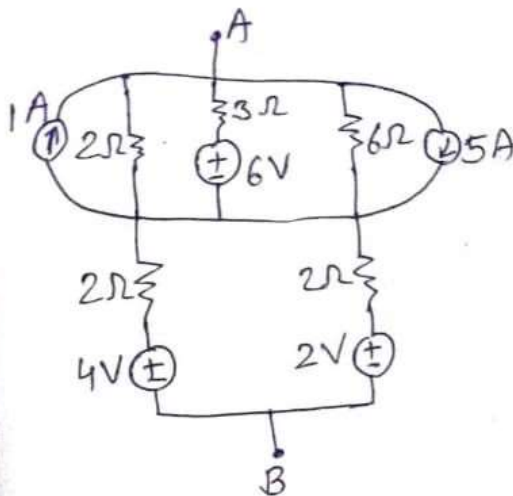


Fig 3

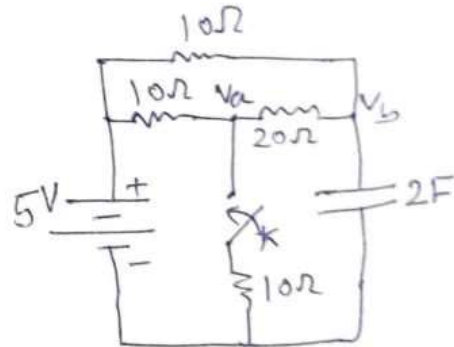


Fig 4

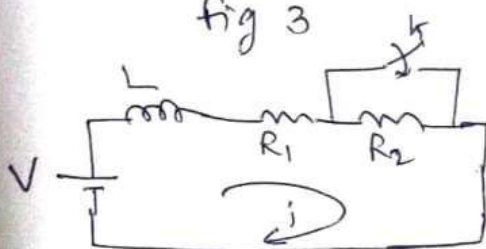


Fig 5

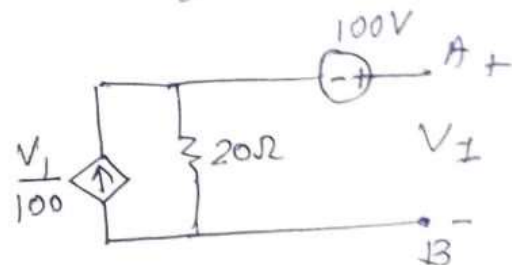


Fig 6

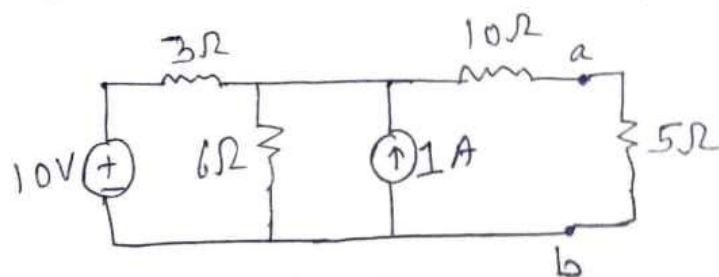


Fig 7

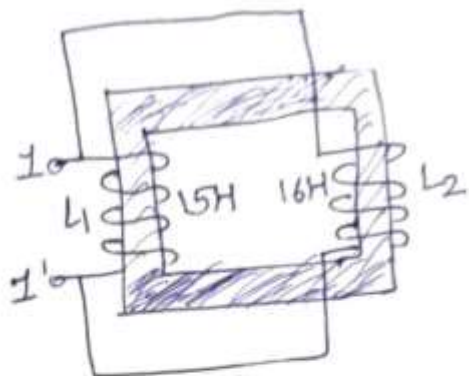


fig. 8

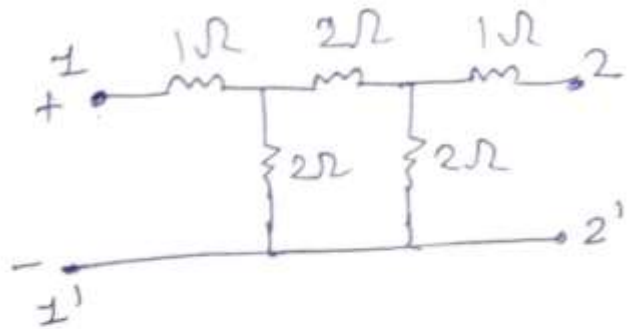


fig 9

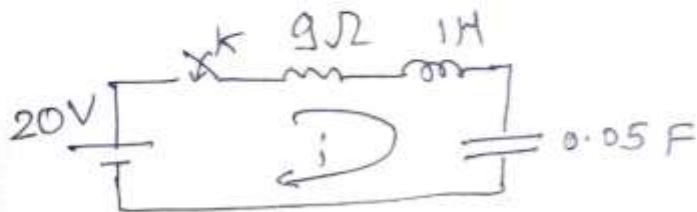


fig 10
