Final Assessment Test – April 2019

VIT
Vellore Institute of Technology

Course: ECE2001 - Network Theory

Class NBR(s): 5884 / 5886 / 5888 / 5890 / 5892 / 5894

Slot: D1+TD1

Time: Three Hours

Max. Marks: 100

General Instructions :

i. **Steps need to be shown in numerical and derivations to avail step marks.**
ii. **Assume necessary data, if required in any question.**

Answer ALL Questions

1. Obtain V_o and I_o in the circuit of Figure 1 using mesh analysis. [10]

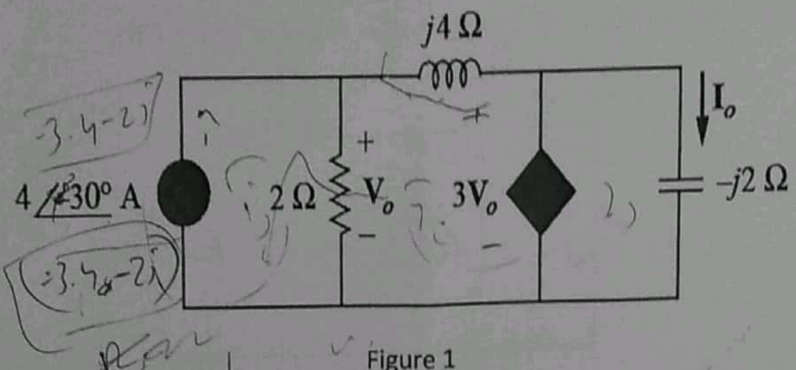

Figure 1

2. Find $v_0(t)$ of the circuit of Figure 2 using superposition theorem. [10]

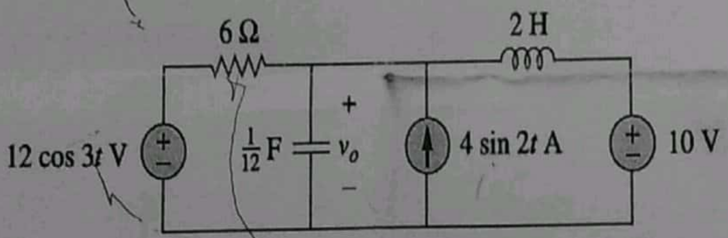

Figure 2

3. Consider the parallel RLC circuit of Figure 3. Find $v(t)$ and $i(t)$ given that $v(0) = 5\ V$ and $i(0) = -2\ A$. [10]

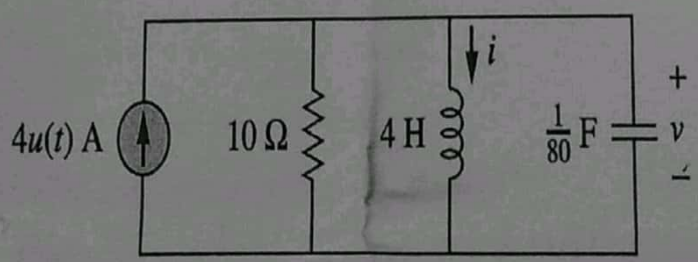

Figure 3

4. a) In the circuit of Figure 4 (a), the switch moves from position 'a' to position 'b' at $t = 0$. Find $i(t)$ for $t > 0$. Also, verify the final value theorem. [5]

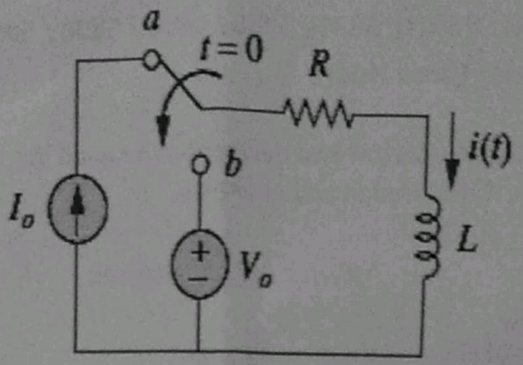

Figure 4 (a)

b) Obtain the transfer function $H(s) = V_o(s)/V_s(s)$ for the circuit of Figure 4 (b). [5]

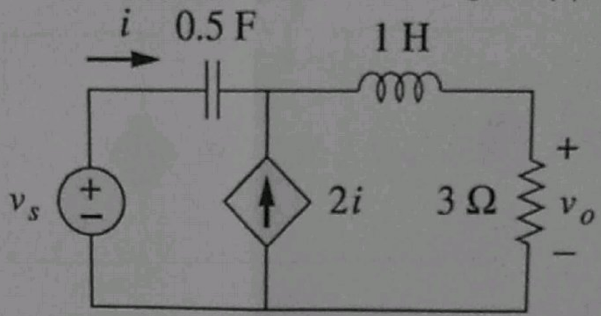

Figure 4(b)

5. The saw tooth waveform in Figure 5 (a) is the voltage source $v_s(t)$ in the circuit of Figure 5 (b). Find the response $v_o(t)$. [10]

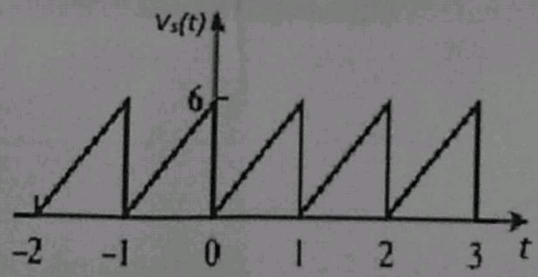

Figure 5 (a)

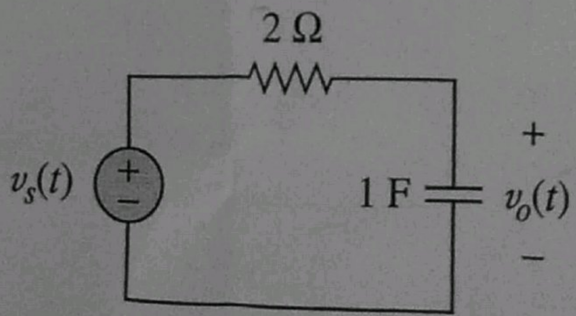

Figure 5(b)

6. Using the Fourier transform method, find $i_0(t)$ in Figure 6, when $i_s(t) = 10\sin 2t\ A$. [10]

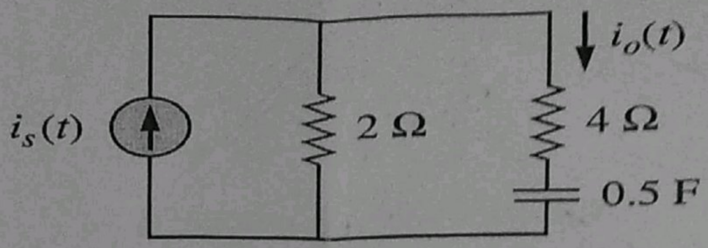

Figure 6

7. Find the impedance parameters for the two-port network in Figure 7. From the obtained impedance parameters, find admittance parameters. Is the network reciprocal? [10]

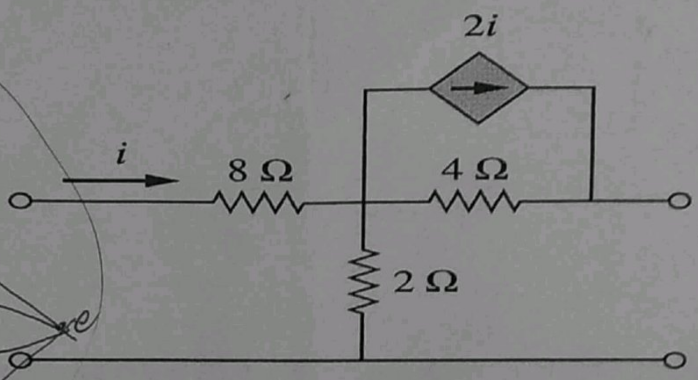

Figure 7

8. Determine the h-parameters for the circuit in the Figure 8. [10]

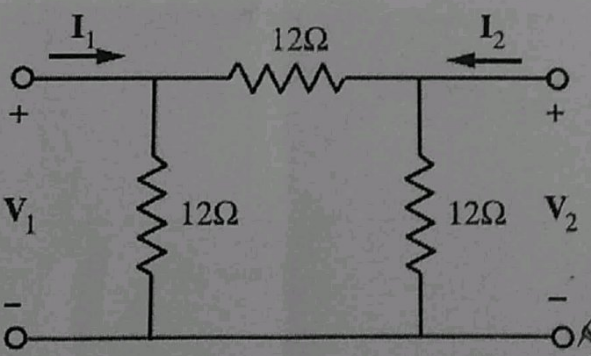

Figure 8

9. a) For the reduced incidence matrix shown below, draw the graph. [5]

$$
\begin{array}{c}
\begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \end{array} \\
\begin{array}{c} a \\ b \\ c \\ d \end{array}
\begin{bmatrix}
1 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\
0 & 1 & 0 & 0 & -1 & 1 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & -1 & 1 & -1 \\
0 & 0 & 0 & 1 & 0 & 0 & -1 & 0
\end{bmatrix} \\
e \quad +1 \quad -1 \quad -1 \quad -1 \quad 0 \quad 0 \quad 0 \quad 0
\end{array}
$$

b) Consider the graph in Figure 9(a). For the given tree in Figure 9(b), formulate the tie-set matrix. [5]

$$\begin{array}{c|ccccc} & 1 & 2 & 3 & 4 & 5 \\ \hline 1 & 1 & 1 & 0 & -1 & 0 \\ 2 & 0 & -1 & -1 & 0 & 1 \end{array}$$

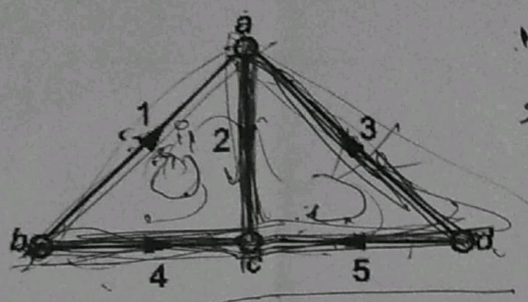

Figure 9 (a)

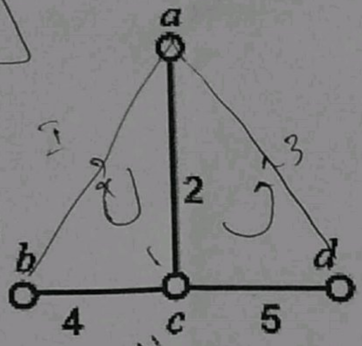

Figure 9 (b)

10. Determine what type of filter is shown in Figure 10. Calculate the corner or cut-off frequency. Take $R = 2\,k\Omega,\ L = 2\,H$ and $C = 2\,\mu F$ **[10]**

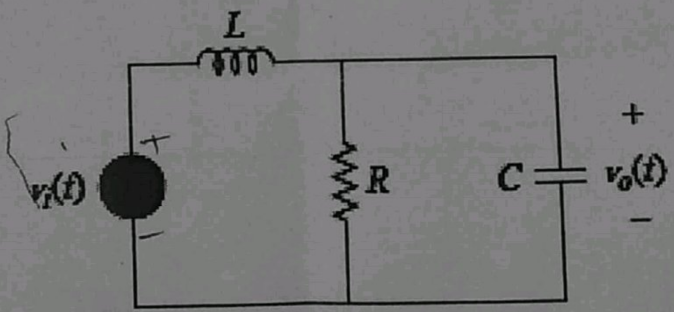

Figure 10

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device that a measures/detect