B.Tech. ECE (Avionics), IIST

End Semester, 05/12/2022, Total Marks 50.

# AV 213: Network Analysis

---

*Instructions: Be relaxed. Notations used have their usual meanings unless specified otherwise. There are nine questions. Answer them all. All the best.*

1) For the network and the input as shown in Figure 1, find the expression of $i(t)$ for $t \geq a$ and then plot its waveform. $R$, $L$ and $a$ are $1\Omega$, $4\ H$ and $2\ sec$ respectively. (5)

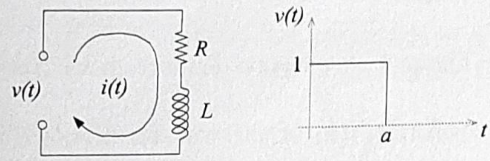


Figure 1: $R-L$ network with pulse input.

2) For the network shown in Figure 2, find $Z$ and $Y$ parameters in $s$ domain. Values of $L$, $C$ and $R$ are $1\ H$, $1\ F$ and $1\ \Omega$ respectively (6)

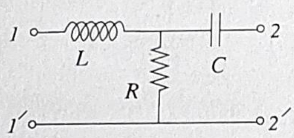


Figure 2: 2 port network.

3) For the network shown in Figure 3, derive the expression and the value of resonance frequency $\omega$. Given that $L_1 = 2\ H$, $L_2 = 10\ H$, $M = 2\ H$ and $C = 0.25\ F$. (5)

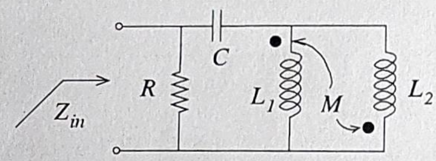


Figure 3: Resonance in network.

4) Use Laplace Transformation to find $y(t)$ for the following

$$y'(t) - 6y(t) = 0.$$

It is given that $y(-1) = 4$. (6)

5) Design an active $1^{st}$ order high pass filter which passes frequencies $\geq 2\ kHz$ without any change to gain and phase and and attenuates frequencies $\leq 2\ Hz$ by atleast $20\ dB$. Choose the highest possible corner frequency for this application. (6)

6) In Figure 4, switch $Sw$ is closed at $t = 0$, the network had previously reached steady state. All the resistors shown are $10\,\Omega$ resistors and the inductors are $1\,H$ inductors. Find the current in $R_3$ applying ($a$) Thevenin and ($b$) Norton Theorem. $(4 + 3 = 7)$

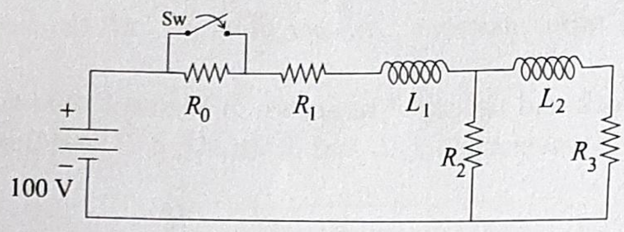


Figure 4: Application of Thevenin and Norton Theorems.

7) Find Laplace Transform $F(s)$ of the waveform shown in Figure 5. (5)

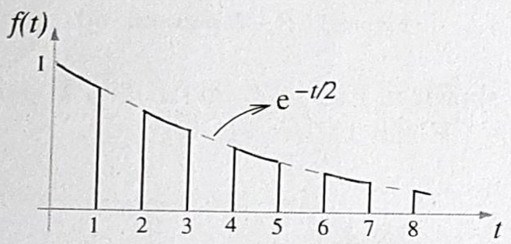


Figure 5: Exponentially decaying $f(t)$

8) The network shown in Figure 7 had initially reached steady state with the switch $Sw$ open. At $t = 0$, $Sw$ is closed. Find $v_o(t)$ for $t \geq 0$. Given that $I_o = 3A$, $C_o = 2F$, $R_1 = R_2 = 4\Omega$ and $V_B = 24V$. (5)

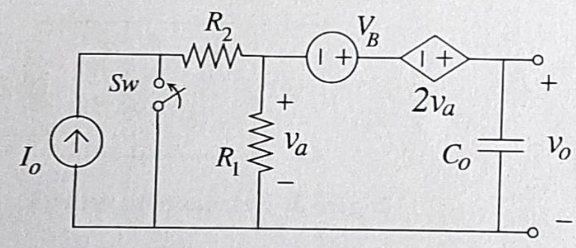


Figure 6: Dual fed network.

9) For the network shown in Figure 7, the capacitor was charged to 200 $kV$ and then the $Sw$ was closed. Let that instant of closure be $t = 0$. Find out $v_T$ for $t \geq 0$ and the time taken to reach the maximum value of $v_T$. $(2 + 3 = 5)$

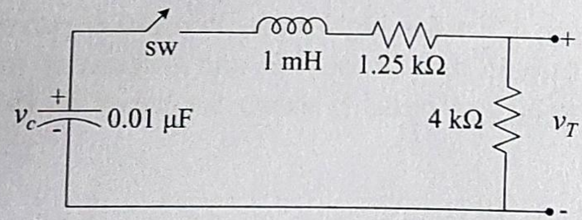


Figure 7: Dual fed network.

*end of question paper*