B.Tech. ECE (Avionics), IIST

Quiz 1, 16/09/2022

AV213: Network Analysis

Be relaxed. Read all the questions carefully first and start answering with those that appear easy. Approach towards solving a problem is as important as the final answer. Each step should be shown clearly. Total Marks 15.

1) An RC circuit consists of a series connected constant 120V source, a switch, a $34M\Omega$ resistor and a 15μF capacitor. It is used in estimating the speed of a horse running a 4 Km race track. The switch is closed when the horse begins to run and opened when it crosses the finishing line. If, the capacitor was found to be charged to 85.6 V, calculate the speed of the horse in m/sec. (Marks: 4)

2) The network shown in Figure 1 reached steady state initially with the switch opened. At $t = 0$, Sw is closed. Given : $V_A = 10$V, $V_B = 20$V, $R_a = 30\Omega$, $R_b = 20\Omega$ and $L = 0.5$H. For $t \geq 0$,

- Find the expression for $i(t)$ and sketch the waveforms of $v(t)$ and $i(t)$ clearly noting the salient values/points.
- Suppose at t=0.2 sec, the Sw is opened again and then at subsequent periodic intervals of 0.2 sec it is made to toggle its position (from open to close and vice versa). Sketch the waveforms of $i(t)$ and $v(t)$ clearly noting the salient values/points. You may assume $e^{-a} \approx 0$ for $a \geq 4$.

(Marks: 4 + 2)

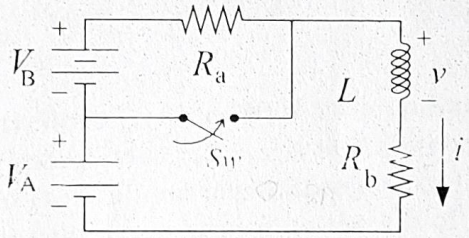

Figure 1: Switched RL network.

3) The network shown in Figure 2 was initially relaxed. At $t = 0$, Sw is closed. $v_{in}(t) = V_m \sin\left(\frac{t}{\sqrt{MC}}\right)$. Derive expressions for $v_a(0+)$ and $\frac{dv_a(0+)}{dt}$. (Marks: 2 + 3)

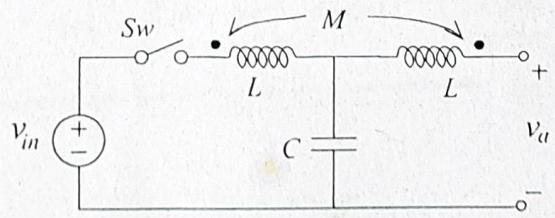

Figure 2: Coupled LCL network.