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B028314(028)

B. Tech. (Third Semester) Examination, Nov.-Dec. 2020

(AICTE Scheme)

NETWORK THEORY

(Electronics & Telecommunication Engg. Branch)

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

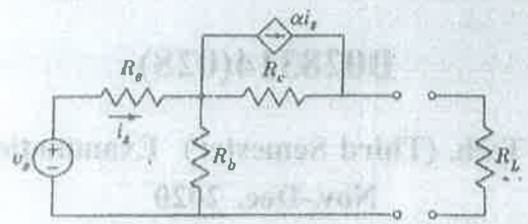
Note : *Attempt all questions. Part (a) carries 4 marks and is compulsory. Attempt any two parts from part (b), (c) and (d) carrying 8 marks each.*

Unit-I

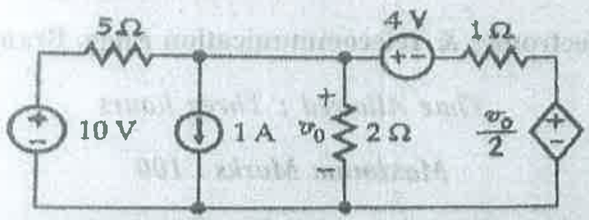
1. (a) (i) State Maximum Power Transfer Theorem.

(ii) Define Average power and Complex power.

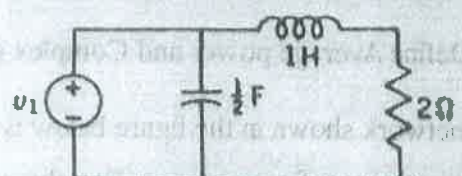
(b) The network shown in the figure below is a simple representation of a transistor. For this network, determine the Thevenin's equivalent network for the load R_L.



(c) In the network of the figure shown below, find v_0 using Superposition theorem.



(d) The network of the figure is operated in the sinusoidal steady with the element values given and $v_1 = 100 \cos 2t$. Determine (a) the complex power generated by the source, (b) the effective current in each of the passive elements, and (c) the complex power for each of the passive elements in the network.

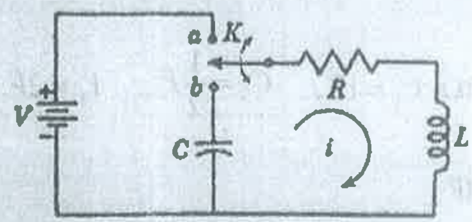


Unit-II

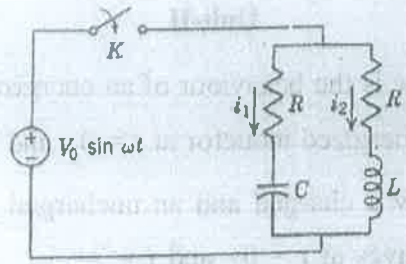
2. (a) (i) How is the behaviour of an energized and an unenergized inductor at $t = 0+$ and $t = \infty$.

(ii) How a charged and an uncharged capacitor behaves at $t = 0+$ and $t = \infty$.

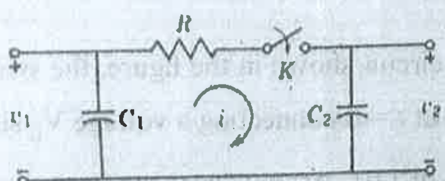
(b) In the network of the figure, switch K is changed from position a to b at $t = 0$. Solve for i di/dt and d_2i/dt_2 at $t = 0+$ if $R = 1000\ \Omega$, $L = 1H$, $C = 0.1$ μF and $V = 1000$ V.



(c) In the circuit shown in the figure, the switch K is closed at $t = 0$ connecting a voltage $V_0 \sin \omega t$, to the parallel RL-RC circuit. Find (a) di_1/dt and (b) di_2/dt at $t = 0+$.



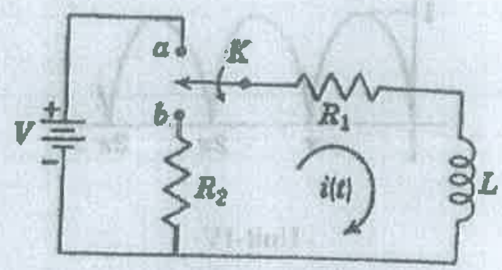
(d) In the network given, the initial voltage on C_1 is V_1 and on C_2 is V_2 such that $v_1(0) = V_1$ and $v_2(0) = V_2$. At $t = 0$, the switch is closed, determine the values of dv_1/dt and dv_2/dt at $t = 0+$. If $R_1 = 1\Omega$, $C_1 = 1F$, $C_2 = \frac{1}{2}F$, $V_1 = 2V$ and $V_2 = 1V$.



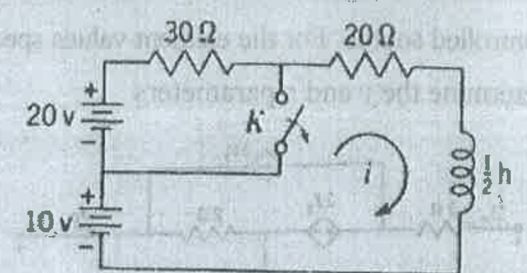
Unit-III

3. (a) State and prove Time Shifting Theorem.

(b) In the network of the figure, the switch K is moved from position a to position b at $t = 0$, a steady state having previously been established at position a. Solve for current $i(t)$, using the Laplace transformation method.

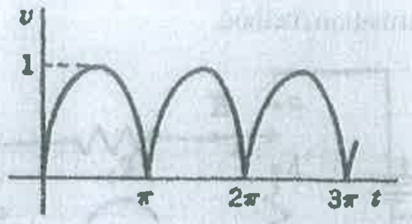


(c) The network of the figure reaches a steady state with the switch K open. At $t = 0$, switch K is closed. Find $i(t)$ using the numerical values given, using the Laplace transformation method.



(d) The waveform shown in the figure is that of a fullwave rectified voltage. The equation for the waveform is $\sin t$ from 0 to π, $-\sin t$ from π to 2π, etc. Show that the transform of this function is :

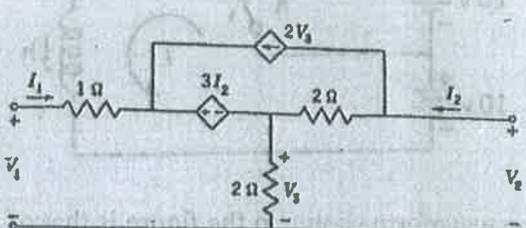
$$F(s) = \frac{1}{s^2+1}\coth\frac{\pi s}{2}$$



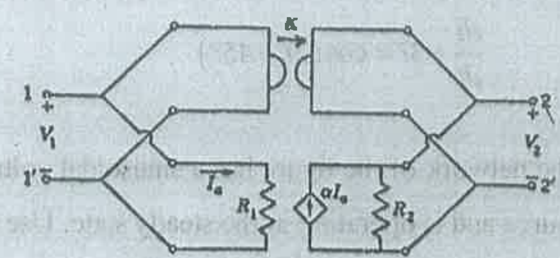
Unit-IV

4. (a) Why h-parameters are called hybrid parameters? Write the application of h-parameters?

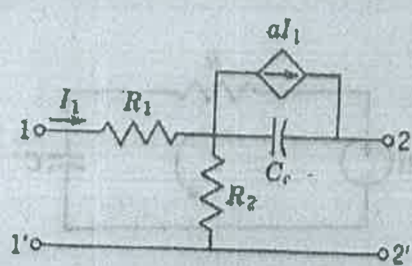
(b) Why the z-parameters are called open circuit impedance parameters? The network shown below contains a voltage controlled source and a current controlled source. For the element values specified, determine the y and z parameters.



(c) The accompanying figure shows two two-port networks connected in parallel. One two-port contains only a gyrator and the other is a resistive network containing a single controlled source. For this network, determine the y-parameters.



(d) The network of the figure represents a certain transistor over a given range of frequencies. For this network, determine the h parameters.



Unit-V

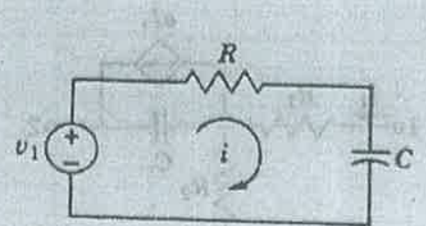
5. (a) Define Sinusoid. What is the relation between

Sinusoid and $e^{\pm j\omega t}$?

(b) Using the method of solution using $e^{\pm j\omega t}$, solve the following differential equation for the steady-state solution.

$$\frac{di}{dt} + 3i = \cos(2t + 45°)$$

(c) The network of the figure has a sinusoidal voltage source and is operating in the steady state. Use the method of determining the response due to $e^{\pm j\omega t}$, determine the steady-state current $i(t)$ if $v_1 = 2\cos 2t$.



(d) In the network of the figure shown below $i_1 = 3\cos(t + 45°)$ and the network is operating in

the steady state. Using the method of determining the response due to $e^{\pm j\omega t}$, determine the node to datum voltage $v_1(t)$.