



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 131312

Roll No.

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B. Tech.(SEM. III) (ODD SEM.) THEORY
EXAMINATION, 2014-15**NETWORK ANALYSIS AND SYNTHESIS**

Time : 3 Hours]

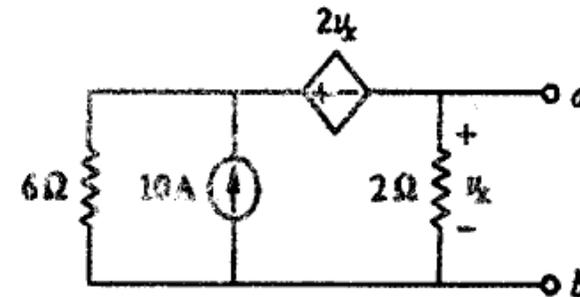
[Total Marks : 100

- Note :**
- (1) Attempt All Questions.
 - (2) Assume suitable data if missing.

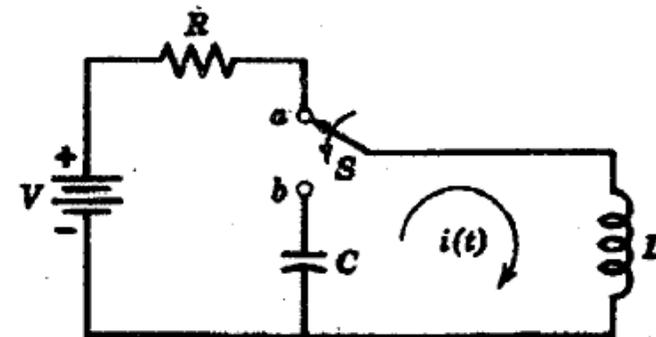
1 Answer any four parts of the following : $4 \times 5 = 20$

- Write the condition for a system to be causal. Is causal system physically realizable or not.
- What do you mean by linear time invariant system? Also differentiate between lumped and distributed elements.
- Write the statement of Norton and Thevenin's theorem. In which type of networks these are not applicable?

- Find the Norton equivalent circuit of the circuit in Figure at terminals a-b.



- For the network shown, before the switch moves from a to b, steady state conditions prevailed. Find the current $i(t)$.

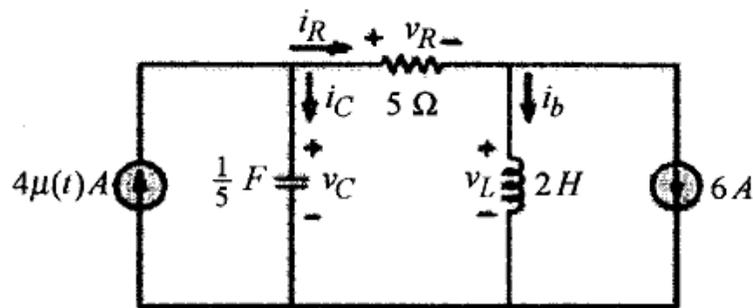


- Prove the convolution theorem and find the convolution of two rectangular pulses of width T and amplitude A .

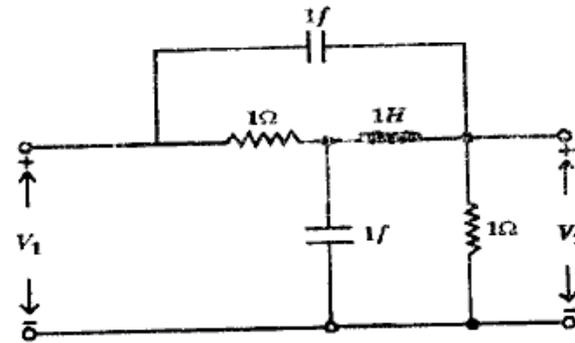
2 Answer any four parts of the following : $4 \times 5 = 20$

- Write the properties of L-C driving point functions.

- (b) Prove that poles and zeros of driving point functions must be interlace for any one of the combinations (R-C, L-C, and R-L).
- (c) What do you mean by system function? What are different types of the system function? Also define the impulse and step response of a system.
- (d) What do you mean by complementary function and particular integral in the solution of a differential equation?
- (e) For the circuit in Figure find:
- $i_L(0^+)$, $V_C(0^+)$, $V_R(0^+)$
 - $i_L'(0^+)$, $V_C'(0^+)$, $V_R'(0^+)$
 - $i_L(\infty)$, $V_C(\infty)$, $V_R(\infty)$



- (f) Obtain $\frac{V_2(s)}{V_1(s)}$ for the network shown.

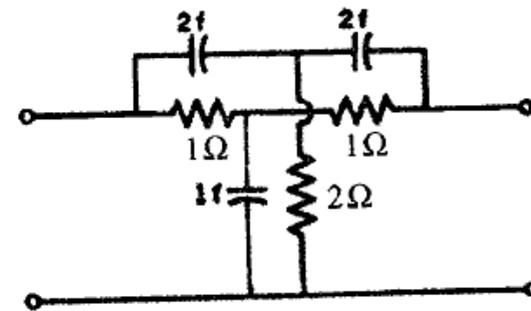


3 Answer any two parts of the following : $2 \times 10 = 20$

- (a) What do you mean by positive real function? Why a driving point function should be positive real to be realizable? Find the conditions of a, b and c such that the following function is positive real function.

$$F(s) = \frac{S^2 + a_1S + a_0}{S^2 + b_1S + b_0}$$

- (b) Why Y- parameters are called short circuit parameters? Find the Y- parameter of the following network.

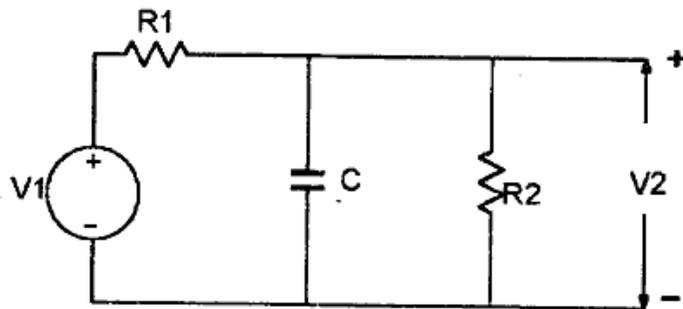


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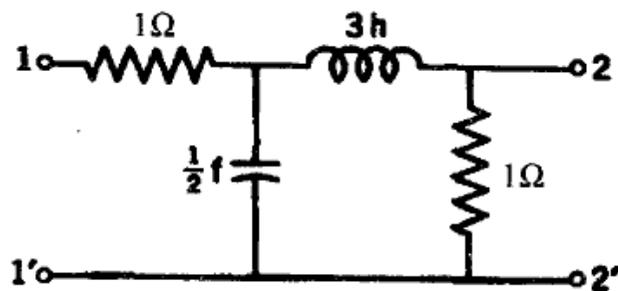
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- (c) In the given network $v_1 = e^{-t}$ for $t \geq 0$ and is zero for all $t < 0$ if the capacitor is initially uncharged, find the value of $\frac{d^2 v_2}{dt^2}$ and $\frac{d^3 v_2}{dt^3}$ at $t = 0^+$, Let $R_1 = 10\Omega$, $R_2 = 20\Omega$ and $C = \frac{1}{20} F$.

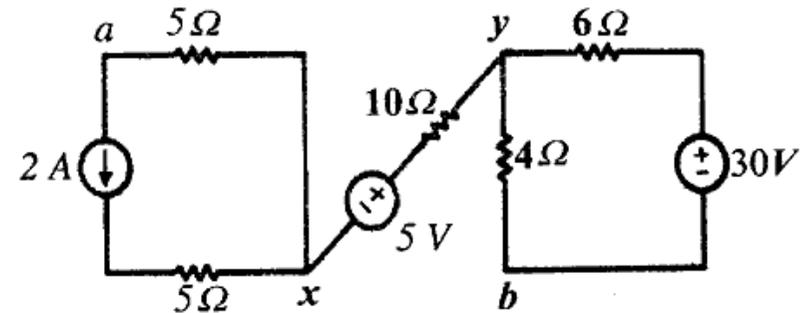


4 Answer any two parts of the following : $2 \times 10 = 20$

- (a) What do you mean by residue condition in terms of transfer function? Show that the residue condition holds for the following network.



- (b) Discuss the properties of R-C driving point impedance function and R-L driving point impedance function. Find the voltage between nodes a and b.



- (c) List the properties of a transfer function. Synthesize the following transfer function in the form of a L-C network.

$$Z(s) = \frac{s^3}{s^3 + 3s^2 + 4s + 2}$$

5 Answer any two parts of the following : $2 \times 10 = 20$

- (1) Which of the following functions are L-C driving point impedances?

(i) $Z(s) = \frac{s(s^2 + 4)(s^2 + 16)}{(s^2 + 9)(s^2 + 25)}$

(ii) $Z(s) = \frac{(s^2 + 1)(s^2 + 8)}{s(s^2 + 4)}$

Also Synthesis the network.

- (b) Discuss briefly the active network synthesis. Determine the damped natural frequency, damping ratio and dc gain of the following transfer function.

$$F(s) = \frac{b_1 s + b_0}{s^2 + a_1 s + a_0}$$

Also represent this transfer function in terms of block diagram.

- (c) Obtain an active RC realization of the band pass voltage transfer function

$$Z(s) = \frac{2s}{s^2 + 3s + 4}$$
