Printed Pages : 7

NEC-301

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

PAPER ID : 131312

Roll No.

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.

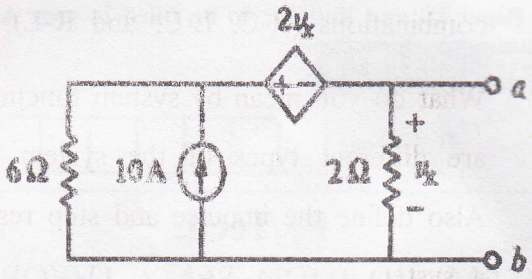
1 Answer any four parts of the following : 4×5= 20

(a) Write the condition for a system to be causal. Is causal system physically realizable or not.

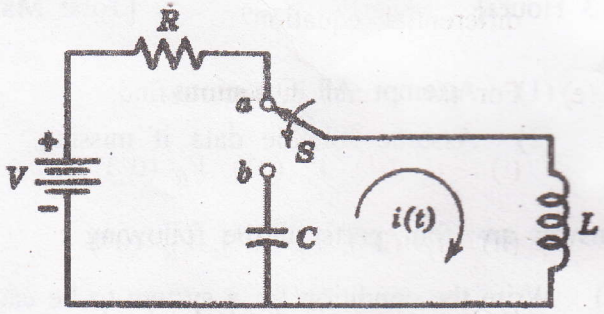
(b) What do you mean by linear time invariant system? Also differentiate between lumped and distributed elements.

(c) Write the statement of Norton and Thevenin's theorem. In which type of networks these are not applicable?

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



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



(f) 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 : **4×5=20**

(a) 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.

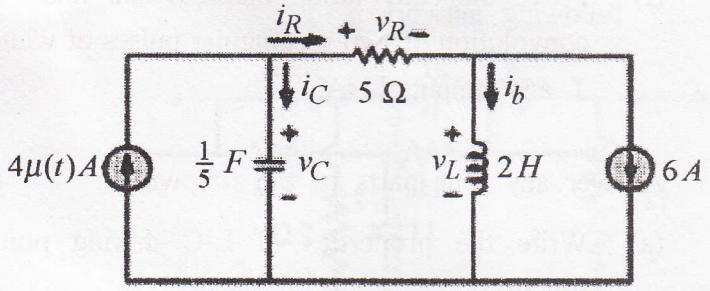
(d) What do you mean by complementary function and particular integral in the solution of a differential equation?

(e) For the circuit in Figure find:

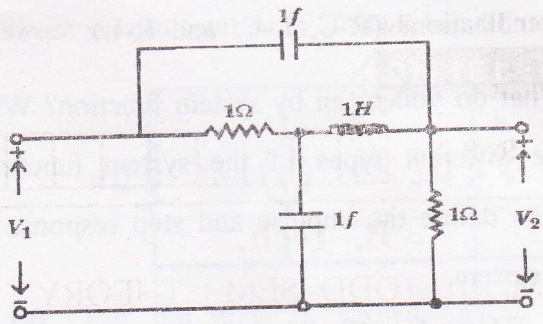
(i) $i_L\ (0^+)$, $V_c\ (0^+)$, $V_R\ (0^+)$

(ii) $i_L'\ (0^+)$, $V_c'\ (0^+)$, $V_R'\ (0^+)$

(iii) $i_L\ (\infty)$, $V_c\ (\infty)$, $V_R\ (\infty)$



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

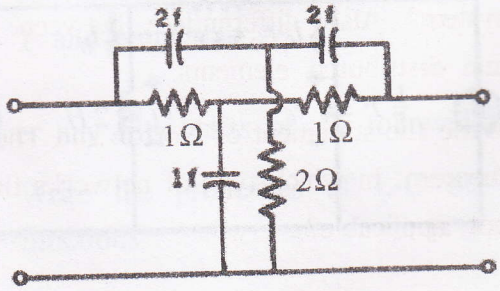


3 Answer any two parts of the following : **2×10=20**

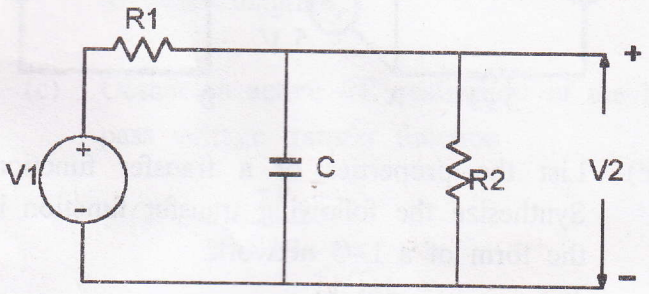
(a) What do you mean by positive real function? Why a driving point function should be positive real to be realizable? Find the conditions of a, b and c such that the following function is positive real function.

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

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

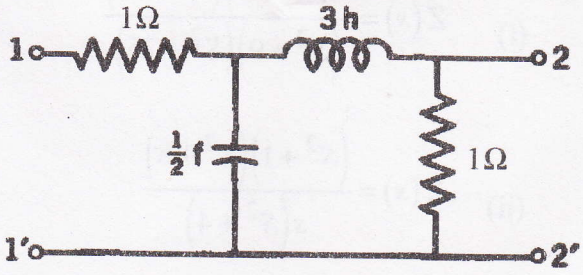


(c) In the given network $v_1 = e^{-t}$ for $t \geq 0$ and is zero for all $t < 0$ if the capacitor is initially uncharged, find the value of $\frac{d^2v_2}{dt^2}$ and $\frac{d^3v_2}{dt^3}$ at $t = 0^+$, Let $R_1 = 10\Omega, R_2 = 20\Omega$ and $C = \frac{1}{20}F$.

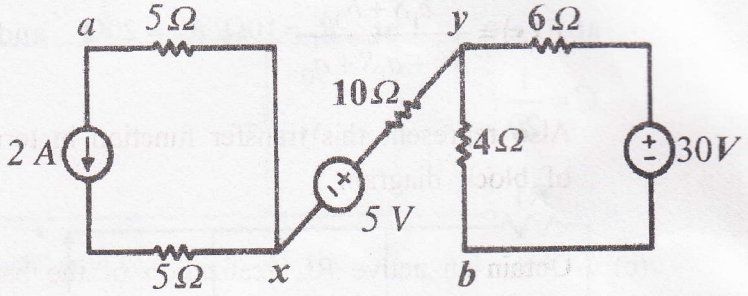


4 Answer any two parts of the following : **2×10=20**

(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 : **2x10=20**

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

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

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

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

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