

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

PAPER ID : 0325

Roll No.

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B. Tech.

(SEM. III) THEORY EXAMINATION 2011-12

FUNDAMENTALS OF NETWORK ANALYSIS AND SYNTHESIS

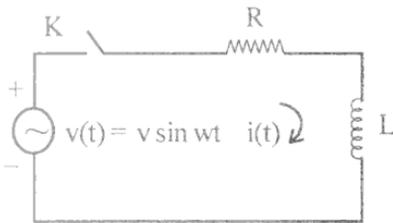
Time : 3 Hours

Total Marks : 100

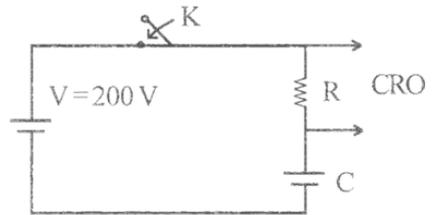
Note :- Attempt **all** the questions. Missing data if any may be suitably assumed.

1. Attempt any **two** parts of the following : **(10×2=20)**

- (a) In the given Circuit– 1, switch K is closed at time $t = 0$. Obtain expression for the current $i(t)$.



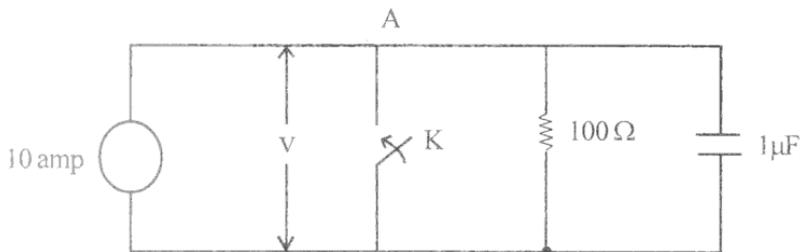
Figure/Circuit –1



Figure/Circuit –2

- (b) In the given circuit :- 2, switch K is closed at time $t = 0$. The waveform is observed on a CRO as shown. The initial value of current is thus found to be 25 mA. The transient disappears i.e. reduces to 2% of its initial value after time 0.1 second. Obtain (i) value of resistor R (ii) value of capacitor C and (iii) expression for current $i(t)$.

- (c) In the given Circuit -- 3, switch K is opened at $t = 0$. Find the values of v , dv/dt and d^2v/dt^2 at $t = 0_+$.



Figure/Circuit-3

2. Attempt any **four** parts of the following : (5×4=20)

- (a) Use the convolution integral, find the inverse transform of the following :

(i)
$$F(S) = \frac{1}{S^2(S+2)}$$

(ii)
$$F(S) = \frac{1}{(S^2+a^2)^2}$$

- (b) Find the current flowing in branch AB in the unbalanced bridge shown in Figure-4, when this branch has a resistance of 3.6 ohms.

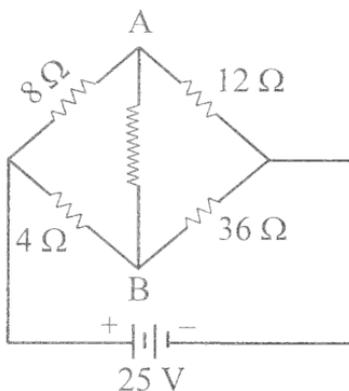


Figure-4

- (c) Prove that for a passive reciprocal network $AD - BC = 1$, where A, B, C and D are transmission parameters.

- (d) Using Laplace transformation solve the following differential equation :

$$\frac{d^2i}{dt^2} + \frac{2di}{dt} + 4i = 4e^t$$

given that $i(0_+) = 3$ and $\frac{di}{dt}(0_+) = -3$.

- (e) Find the transform impedance $Z(s)$ of the given one-port network in Figure-5 :

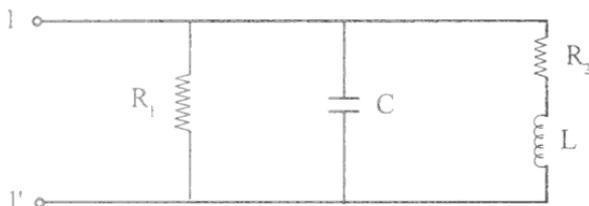


Figure-5

3. Attempt any **two** parts of the following : **(10×2=20)**

- (a) Find the network for the following driving point impedance of a one port LC network :

$$Z(s) = \frac{4(s^2 + 1)(s^2 + 16)}{s(s^2 + 4)}$$

in first and second Foster form.

- (b) Test the following polynomial :

(i) $q(s) = s^6 + 2s^5 + 14s^4 + 26s^3 + 49s^2 + 72s + 36$

(ii) $q(s) = s^5 + s^3 + s$

for the Hurwitz property.

- (c) (i) What is positive real functions ? Write the properties of positive real functions.

- (ii) Write the properties of L-C impedance or admittance functions. **(6+4=10)**

4. Attempt any **two** parts of the following : **(10×2=20)**

- (a) Write the properties of functions $Z_{12}(s)$ and Z_{12} , describing lossless resistively terminated Networks.

- (b) Synthesize a network terminated in a 1-Ohm resistor to meet the specification :

$$Z_{12}(s) = \frac{S^2 + 1}{(S^3 + S^2 + 3S + 2)}$$

- (c) Synthesize a network having the driving-point impedance :

$$Z(s) = \frac{5S^2 + 18S + 8}{S^2 + S + 10}$$

by the Darlington method.

5. Attempt any **two** parts of the following : (10×2=20)

- (a) For the circuit shown in Figure-6, derive an expression for V_{o1} and V_{o2} , assuming ideal op-amp.

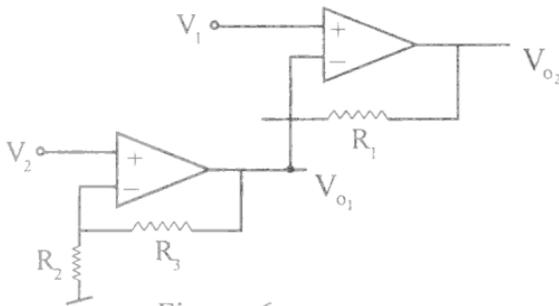


Figure-6

- (b) Draw the circuit of inverting differentiator using one ideal op-amp and determine its transfer function.
 (c) For the circuit shown in Figure-7 find I_o . Assume op-amp ideal one.

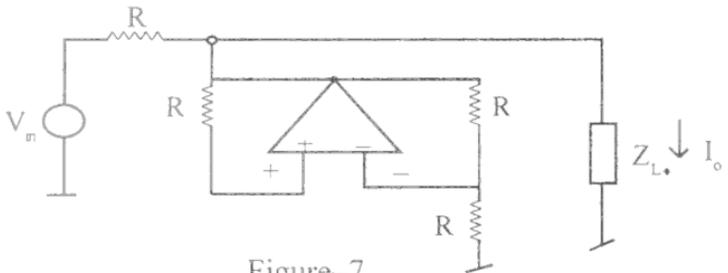


Figure-7