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

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

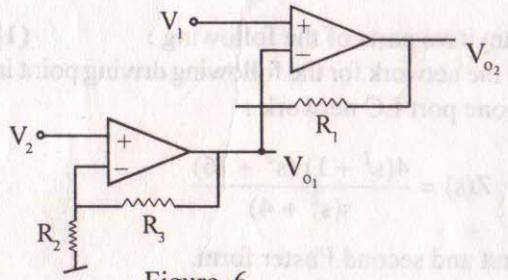
(c) Synthesize a network having the driving-point impedance :

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

by the Darlington method.

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

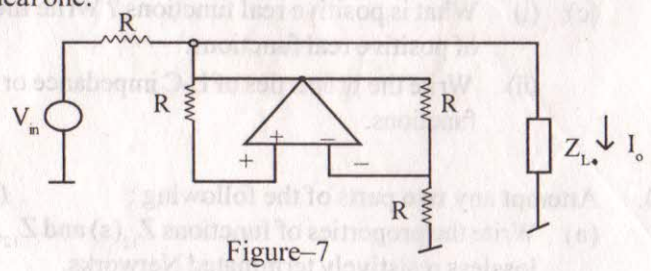
(a) For the circuit shown in Figure–6, derive an expression for $V_{o_1}$ and $V_{o_2}$, assuming ideal op-amp.




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





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

**PAPER ID : 0325** **Roll No.**

**B. Tech.**

(SEM. III) THEORY EXAMINATION 2011-12

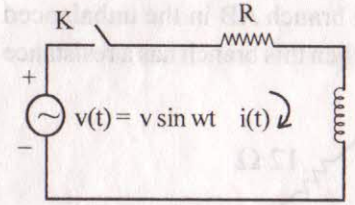
**FUNDAMENTALS OF NETWORK ANALYSIS AND SYNTHESIS**

*Time : 3 Hours* *Total Marks : 100*

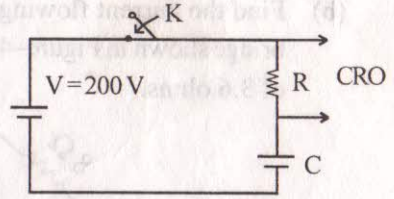
**Note :–** Attempt **all** the questions. Missing data if any may be suitably assumed.

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).



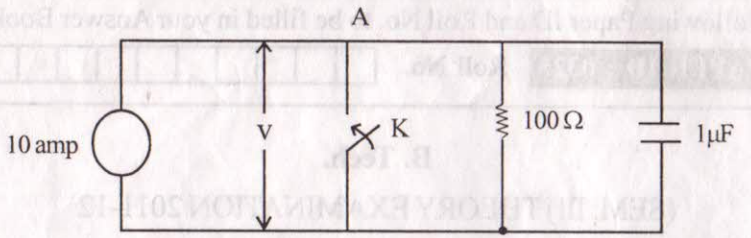

Figure/Circuit –1




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 resister 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

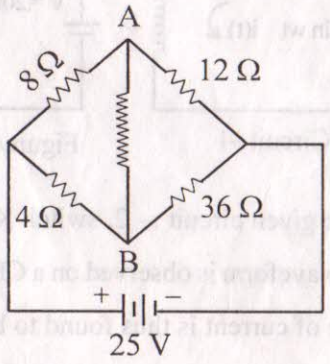
2. Attempt any **four** parts of the following : **(5×4=20)**

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

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

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

(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.

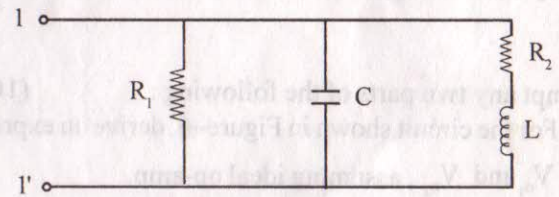


(d) Using Laplace transformation solve the following differential equation :

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

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

(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.