3/6/09

S.E. (EXTC) Sem III (R)

3 p.m. to 6 pm.

Con. 3347-09. Electrical Networks **VR-3366**

(REVISED COURSE)

(3 Hours) **[Total Marks : 100**

N.B.: (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assume **suitable data** if **necessary** and **state** it **clearly**.

1. (i) The reduce incidence matrix is given below. Obtain incidence matrix. **2**

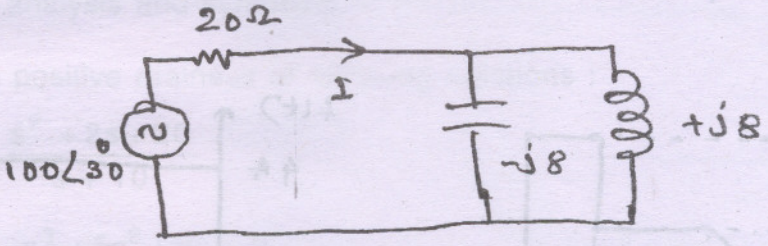
$$A = \begin{bmatrix} 1 & 0 & 0 & -1 & -1 & 0 & 0 & 0 \\ -1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & -1 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

(ii) For the complete incidence matrix of Q. 1(i) draw network graph. **2**

(iii) Draw pole-zero plot for following network function **2**

$$Z(s) = \frac{10\,(s+2)}{s(s+3)(s+5)}$$

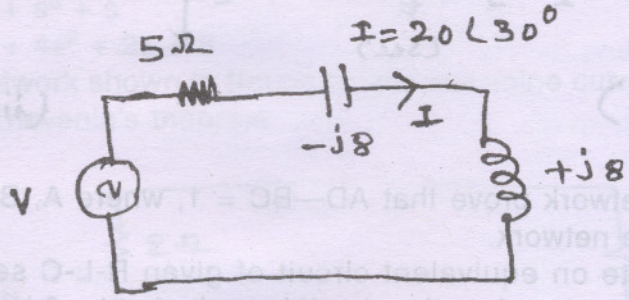
(iv) **2**



For the network shown in the **figure** determine I.

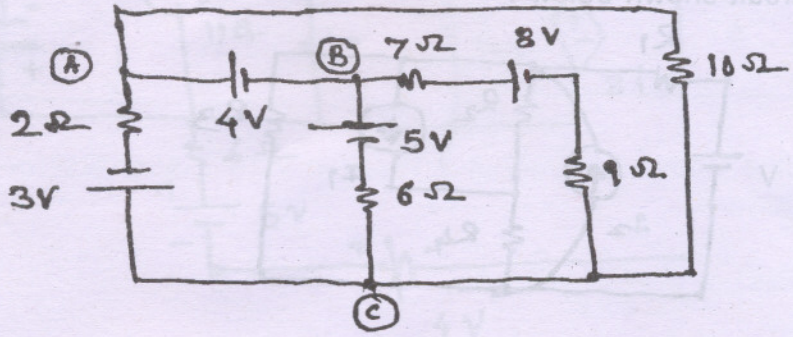
(v) For the Q. 1(iv) network, determine power factor angle. (Determine angle between total voltage and current) **2**

(vi) **2**



For the network shown in **figure** determine V (total voltage applied)

(vii) For the network shown in **figure** below write nodal equation (KCL) at node B. **2**



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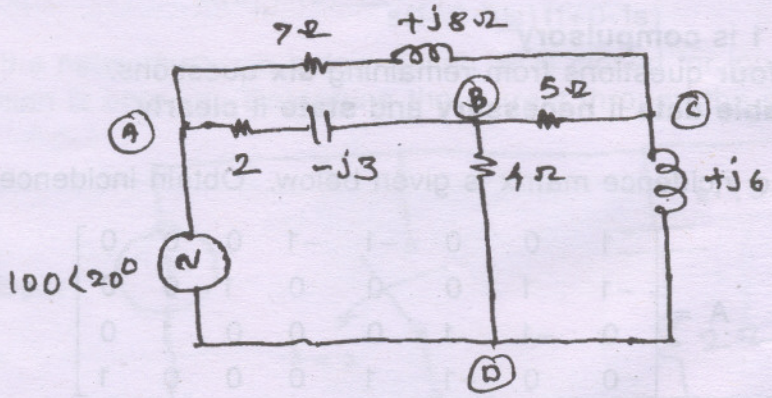
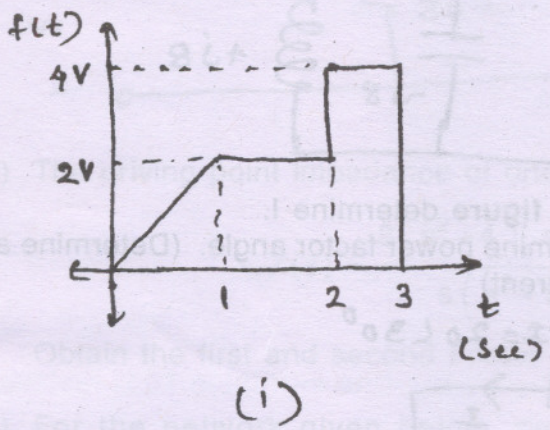
(viii) For the network shown below write nodal equation (KCL) at node B 2



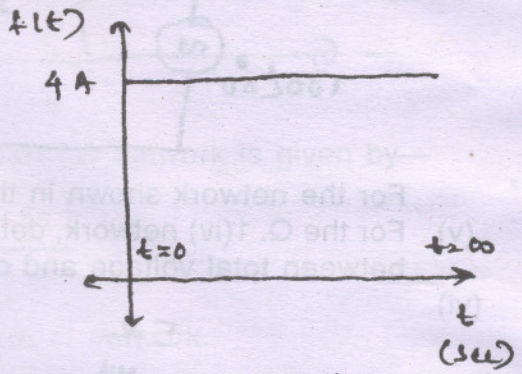
(ix) Under what condition, the transient current in R-L-C circuit is oscillatory ? 2

(x) Define driving point and transfer impedance. 2

2. (a) Determine Laplace transform of the waveforms shown in **figure** below : 10



(i)

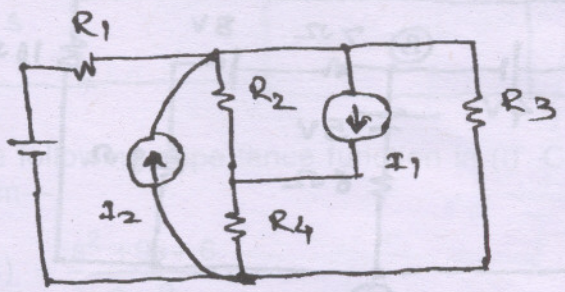


(ii)

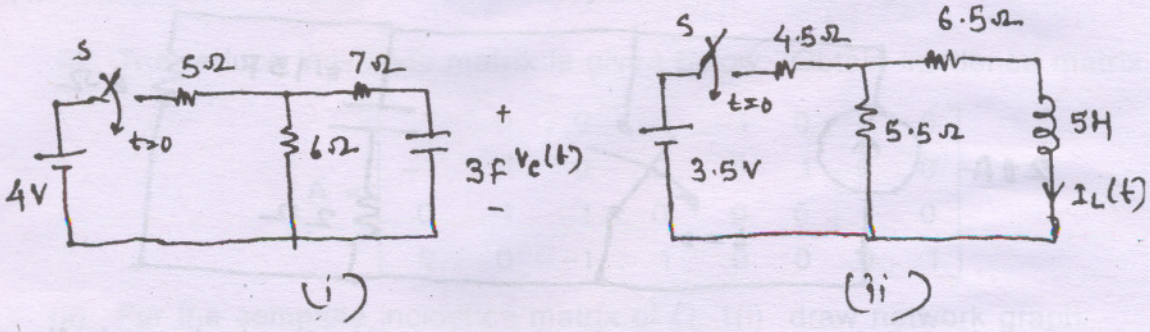
(b) For a two port network prove that AD—BC = 1, where A, B, C and D are parameters of the network. 5

(c) Write a short note on equivalent circuit of given R-L-C series circuit at $t = 0^-$, $t = 0^+$ and $t = \infty$, when the circuit is excited at t = 0 by closing switch with non-zero initial conditions. 5

3. (a) Using principles of network toplogy write loop equations in the matrix form for the circuit shown below : 10



(b) For the networks shown in **figure** below determine $V_C(t)$ and $I_L(t)$ respectively. When switch 'S' is closed at t = 0 with zero initial conditions. (Note : Do not derive the equations used) 5



(c) Explain the terms causality and stability in relation to realisability theory of network analysis and synthesis. 5

4. (a) Find the positive realness of following functions : 10

(i) $\dfrac{s^2 + 2s + 20}{s + 10}$

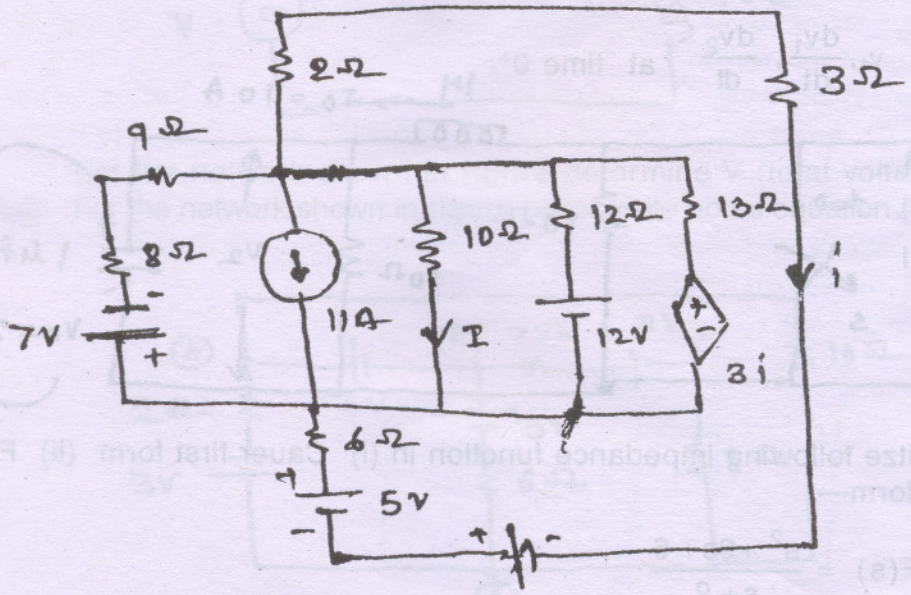
(ii) $\dfrac{s^3 + 5s^2 + 9s + 3}{s^3 + 4s^2 + 7s + 9}$

(b) Check whether following Polynomials are Hurwitz or not. 5

(i) $s^5 + s^3 + s$

(ii) $s^3 + 4s^2 + 2s + 8$

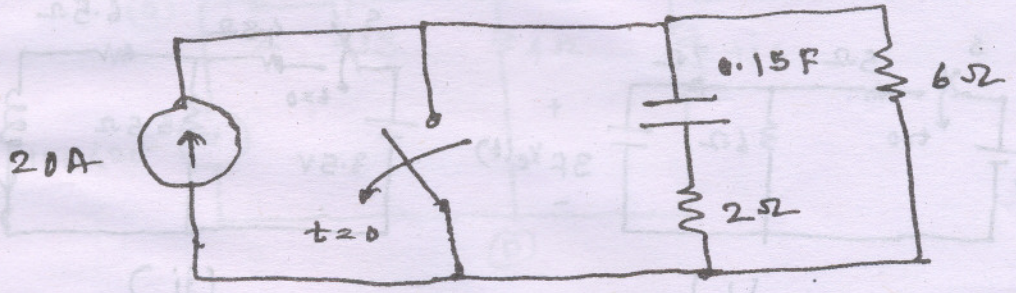
(c) For the network shown in **figure** below determine current in 10 Ω resistance (I) using Thevenin's theorem. 5



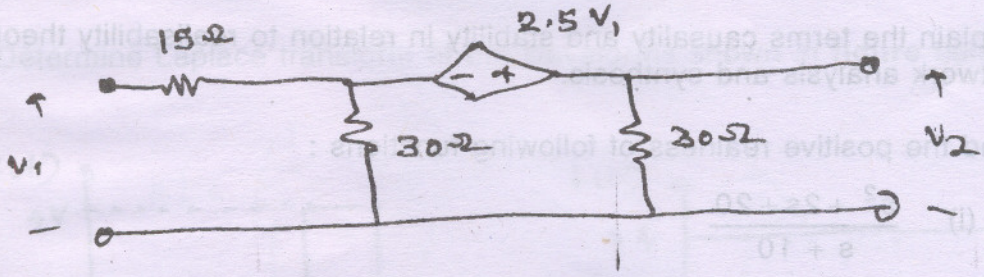
5. (a) Sketch the Bode plot for the transfer function given below : 10

$$G(s)\,H(s) = \frac{10(s+1)}{s(1+0\cdot01s)(1+0\cdot1s)}$$

(b) In the network shown below switch 'S' is closed for long time and at t = 0. Switch is opened. Determine the current through the capacitor. 10



6. (a) Find transmission parameters for the two port network shown in **figure** below : 10



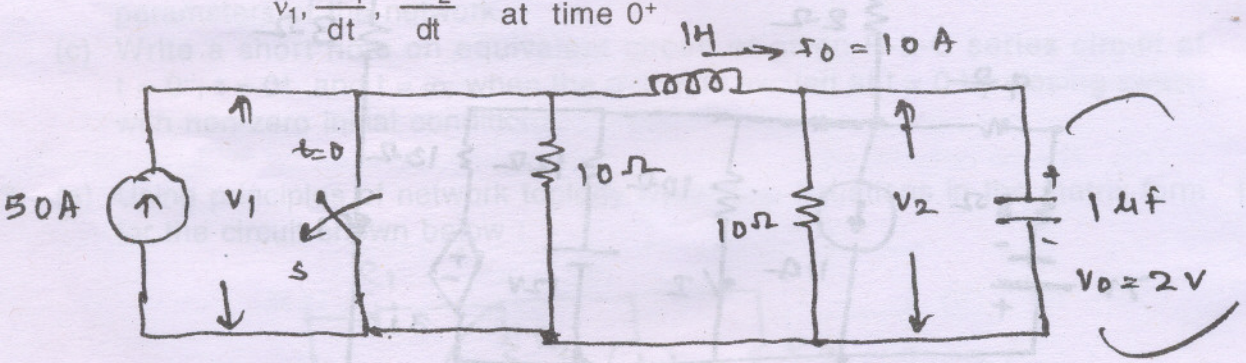
(b) The driving point impedance of one part LC network is given by— 10

$$Z(s) = \frac{8\left(s^2+4\right)\left(s^2+5s\right)}{s\left(s^2+16\right)}$$

Obtain the first and second Foster form of network.

7. (a) For the network given below, switch S is opened at t = 0 with initial conditions shown. Find the values of 10

$v_1, \frac{dv_1}{dt}, \frac{dv_2}{dt}$ at time 0^+



(b) Synthesitze following impedance function in (i) Cauer first form (ii) Foster second form— 10

$$F(s) = \frac{s^2+9s+6}{s+2}.$$