S.E. III Extx

Electrical Network Analysis & Synthesis 8/6/06

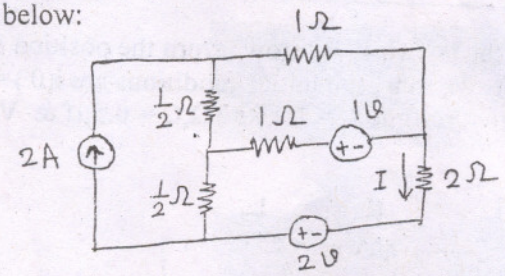
[REVISED COURSE]

CON/1882-06. TV-7962

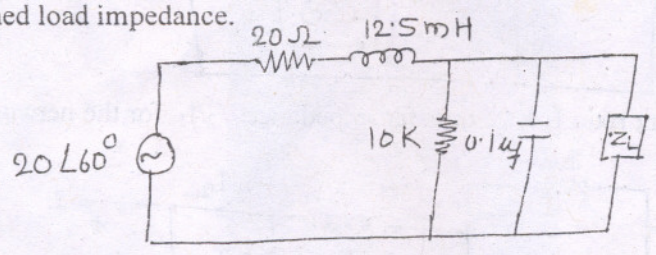
(3 Hours) [Total Marks : 100

N.B. (1) Question No.1 is compulsory.
(2) Answer any four questions from the remaining.
(3) Assume suitable data whenever necessary.
(4) Figure to right indicates full marks.

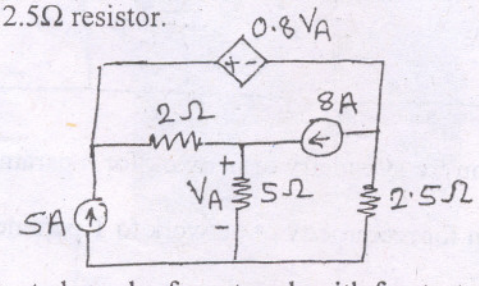
1. (a) Using source shifting and source transformation ,find current I in the circuit Shown below: (10)



(b) At ω = 400 rad/sec Find the Thevenin's equivalent of the following circuit across load impedance Z_L and find the maximum power transferred with conjugate matched load impedance. (10)



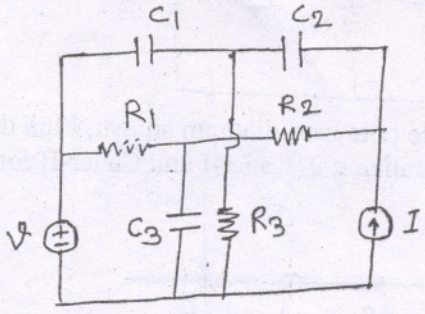
2 (a) With the help of nodal analysis on the circuit shown ,Find V_A and power dissipated in 2.5Ω resistor. (10)



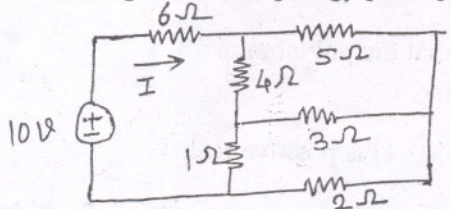
(b) i) Draw the oriented graph of a network with f-cutset matrix as shown below.(5)

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

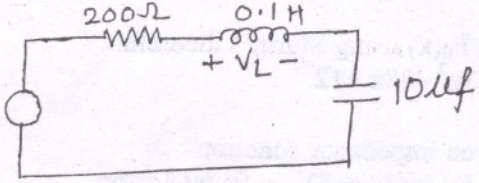
ii) Construct the dual circuit for the circuit shown. (5)



3. (a) Find current I using network topology principles. (10)



(b) Determine whether the R-L-C series circuit shown in figure is under damped over damped or critically damped also find $V_L(0+)$, $di/dt(0+)$ & $i(\infty)$. (10)



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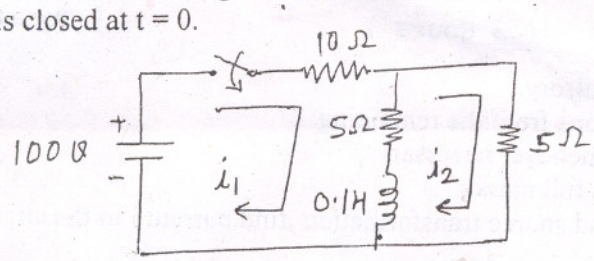
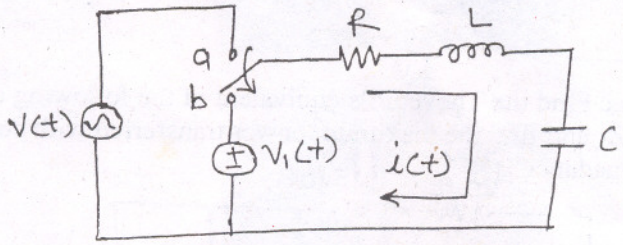
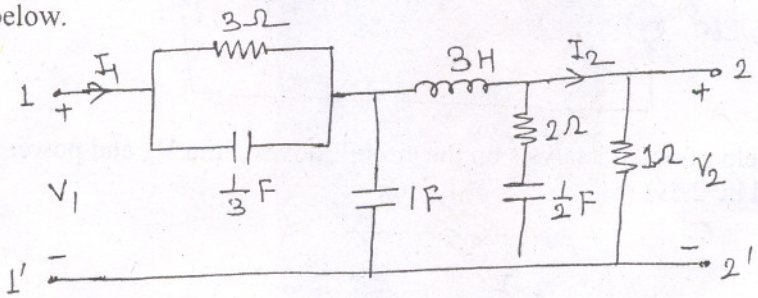
4.(a) For the circuit shown in figure find currents i1(t) & i2(t) which results when switch is closed at t = 0. (10)



(b) In the network shown in figure the switch K is thrown from the position a to b at t=0. Just before the switch is thrown to b , the initial conditions are $i(0^-) = 2A$ & $Vc(0^-) = 2V$. Find the current i(t). Assume L = 1H,R=3Ω,C = 0.5μf & $V_1 = 5V$. Use Laplace transform. (10)



5.(a) Determine the current ratio I_2/I_1 & transfer impedance V_2/I_1. for the network shown below. (10)

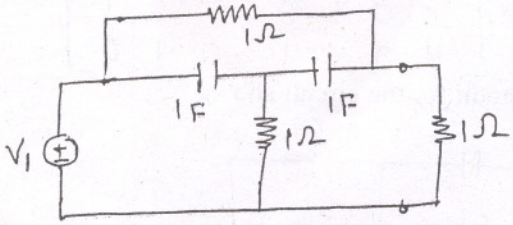


(b) 1) Show that the condition for symmetry of network for h parameter. i.e. Δh=1.(3)

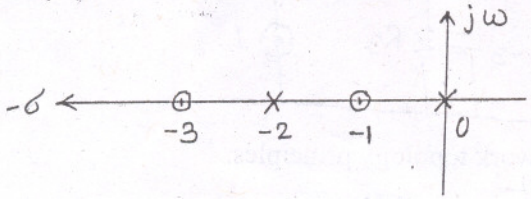
2) Show that the condition for reciprocity of network to T parameter. i.e. ΔT=1.(3)

3) Convert h parameter in terms of T parameter. (4)

6.(a) For the bridge T network shown, find the driving point admittance Y_{11} and Transfer admittance Y_{12} with 1Ω load resistor connected across port 2. (10)



(b) An impedance function has the pole zero diagram shown, Find the impedance function, if Z(-4) = 3/8 and realize it in Cauer-I and Cauer-II form . (10)



7. (a) i) Determine the range of 'k' so that the polynomial
$P(s) = s^3+3s^2+2s+k$ is Hurwitz. (3)

ii) Test whether $f(s) = (s^3-1)/(4s^3-3s^2-1)$ is positive real. (3)

iii) $F(s) = (s+a)/(s^2+bs+c)$ Find the restriction on the values of a, b & c so that the function f(s) is positive real. (4)

(b) i) Factorise the given $P_0(x)$ using Sturm's theorem.
$p_0(x) = = x^4 - 8x^3 + 23x^2 - 28x + 12$. (5)

ii) Synthesize the given impedance function
$Z(s) = (s+2)(s+4)/(s+1)(s+5)$ in foster-I form. (5)