NEW SCHEME

EE34

Reg. No. | | | | | | | | | | |

Third Semester B.E. Degree Examination, January/February 2006

EC/TE/EE/IT/ML/BM

Network Analysis

Time: 3 hrs.)

(Max.Marks : 100

Note: ***Answer any FIVE full questions.***

1. (a) Three impedances are connected in delta. Obtain expressions for their star connected equivalents. **(6 Marks)**

(b) Reduce the network shown in fig Q. 1(b) to a single voltage source in series with a resistance using source shift and source transformations. **(6 Marks)**

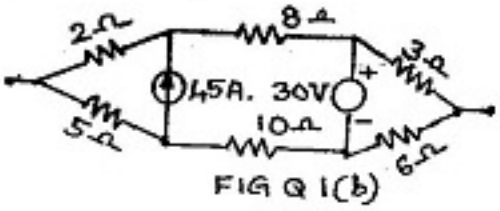

FIG Q 1(b)

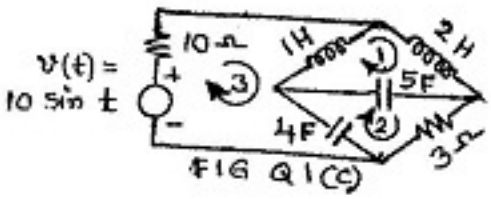

FIG Q 1(c)

(c) For the network shown in Fig Q. 1(c), write the mesh equations, for the meshes indicated, in time domain. Draw the dual network and write its node equations. **(8 Marks)**

2. (a) Find V_2 through the use of nodal analysis, of the network shown in fig Q. 2(a). Also find V_x. **(6 Marks)**

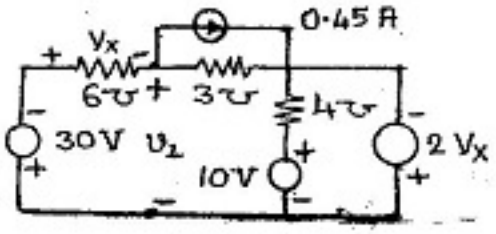

FIG Q 2(a)

(b) Use mesh analysis to determine what value of V_2 in the network shown in fig Q 2(b) causes $v = 0$. v is the voltage across 20Ω. **(6 Marks)**

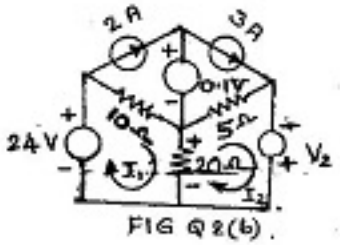

FIG Q 2(b).

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(c) For the network shown in fig Q 2(c), perform source shifts, draw a graph, select tree with branches 1, 2 and 3 and obtain tie set and cut set matrices. **(8 Marks)**

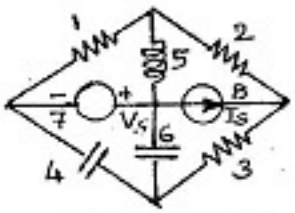

FIG Q 2(C).

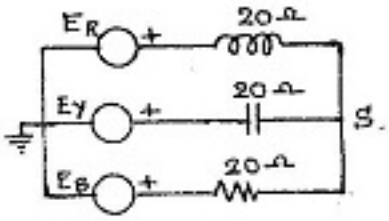

FIG Q 3(a).

3. (a) Use Millmann's theorem to determine the voltage V_s of the network shown in Fig Q 3(a) given that
$E_R = 230 \angle 0^0 V$, $E_Y = 230 \angle -120^0 V$, and $E_B = 230 \angle 120^0 V$, **(6 Marks)**

(b) Prove that an alternating voltage source transfers maximum power to a load when the load impedance is the conjugate of the source impedance. **(6 Marks)**

(c) A linear time invariant network when terminated with i) $R = 1\Omega$, the current is $5 \angle -45^0 A$ ii) $X_c = 1\Omega$, the current is $10 \angle -45^0 A$. Find the Thevinins equivalent of the network. What will be the current if it is terminated with $X_L = 1\Omega$? **(8 Marks)**

4. (a) A series resonant circuit includes $1\mu F$ capacitor and a resistance of 16Ω. If the band width is $500 rad/sec.$ determine i) ω_r ii) Q and iii) L. **(6 Marks)**

(b) A two branch antiresonant circuit contains $L = 0.4\ H$ and $C = 40\ \mu F$. Resonance is to be achieved by variation of R_L and R_C. Calculate the resonance frequency for the following cases :

i) $R_L = 120\Omega,\ R_C = 80\Omega$

ii) $R_L = 80\Omega,\ R_C = 0$

iii) $R_L = R_C = 100\Omega$ **(6 Marks)**

(c) In the case of a series resonant circuit with frequency variation, obtain expressions for

i) ω_C at which maximum voltage occurs across C

ii) ω_L at which maximum voltage occurs across L and show that $\omega_L > \omega_C$ **(8 Marks)**

5. (a) Why do we need to study initial conditions ? Write the equivalent form of the elements in terms of the initial condition of the element. **(6 Marks)**

(b) A parallel R - L circuit is energised by a current source of 1 A. The switch across the source is opened at $t = 0$. Solve for v, Dv and D^2v all at $t = 0+$ if $R = 100\Omega$ and $L = 1H$. **(6 Marks)**

(c) A series R - C branch with $R = 20\Omega$ and $C = 1\mu F$ is shunted by an inductor of resistance 20Ω and inductance $1H$. This is supplied by a D.C. source of $100V$ through a series resistance of 10Ω. There is a switch across 10Ω which is closed at $t = 0$. Solve for the currents in L and C and their derivatives at $t = 0+$. **(8 Marks)**

6. (a) State and prove i) Initial value theorem and ii) final value theorem as applied to L transformation. **(6 Marks)**

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(b) Determine the Thevinin's equivalent $V_{ab}(s)$ and $Z_{ab}(s)$ for the network shown in Fig Q. 6 (b) for zero initial conditions. **(6 Marks)**

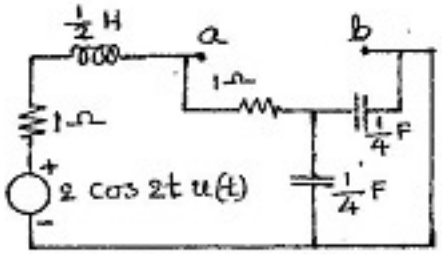

FIG Q 6(b)

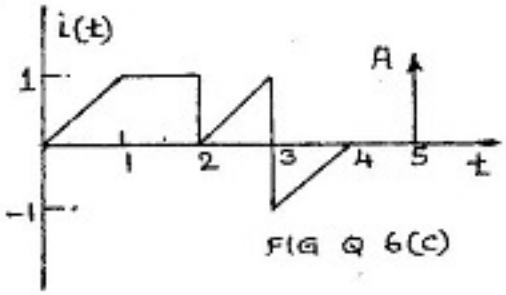

FIG Q 6(c)

(c) The current $i(t)$ shown in fig. Q 6(c) is impressed upon a capacitor C. What should be the value of A of the impulse so that the voltage across the C becomes zero for $t > 5\ sec$? **(8 Marks)**

7. (a) Explain the application of convolution integral in the analysis of linear systems. **(6 Marks)**

(b) A network has a transfer function $H_1(s)$ and the impulse response of the system is a gate function of height 1 and spanning from 0 to 1 sec. Three of these networks are connected such that the overall transfer function is $H_3(s) = [H_1(s)]^3$. Using convolution or otherwise find the impulse response of the new system $h_3(t)$. **(6 Marks)**

(c) For the circuit shown in fig Q. 7(c) the switch is opened at $t = 0$. If $L = \frac{1}{2}H$, $G = 1\ mho$, $C = 1F$ and $V = 1V$, find the node voltages $v_1(t)$ and $v_2(t)$

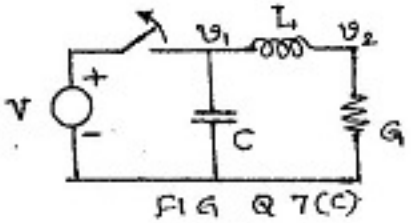

FIG Q 7(c)

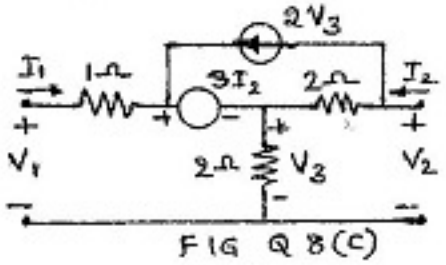

FIG Q 8(c)

(8 Marks)

8. (a) A two port network, in terms of z parameters is said to be symmetric if $z_{11} = z_{22}$ and reciprocal if $z_{12} = z_{21}$. Obtain the corresponding conditions in terms of

i) h parameters

ii) T parameters,
using the relationship between different two port parameters. **(6 Marks)**

(b) Two 2 port networks are connected in cascade. Obtain T parameters of the interconnected network in terms of the T parameters of the individual networks. **(6 Marks)**

(c) For the two port network shown in fig Q. 8(c). obtain z parameters. **(8 Marks)**

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