Registration No. : | | | | | | | | | | |

Total number of printed pages – 4

B. Tech

BEES 2211

Special Examination – 2012

NETWORK THEORY

Full Marks – 70

Time : 3 Hours

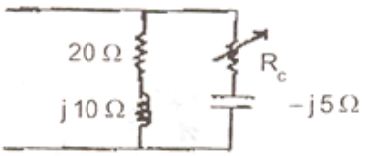
*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 ×10

(a) What do you understand by a 'oriented graph' ?

(b) Calculate the value of R_c in the circuit shown below to yield resonance.



(c) Two coils in differential connection have self inductance of 2 mH and 4 mH and a mutual inductance of 0.2 mH. What will be the equivalent inductance ?

(d) Distinguish between Fourier transform and Laplace transform.

(e) Mention the properties of RL driving point impedance.

(f) Laplace transform of a function F(t) is given as $\frac{s^2 + 2s + 3}{(s^3 + 3s^2 + 3s + 1)}$. Find F(0) and F($\infty$).

(g) What is Foster reactance theorem ?

P.T.O.

(h) For a π network having series impedances as Z_1 and shunt impedance is $2Z_2$. What is the image impedance ?

(i) Z parameter of a 2 port network are $Z_{11} = 10\ \Omega, Z_{22} = 20\ \Omega, Z_{12} = Z_{21} = 5\ \Omega$. Find the A, B, C, D parameters.

(j) Why Y parameters are known as short circuit parameters ?

2. (a) State and explain Milliman's Theorem. 5

(b) For the network shown in figure 2(b). Calculate the maximum power that may be dissipated in the external resistor R. 5

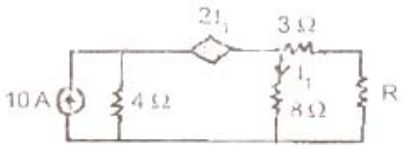


Fig. 2(b)

3. (a) For the network shown in fig. 3(a) below, determine the No. of branches, number of nodes and number of links. Also write down the incidence matrix for the network. 5

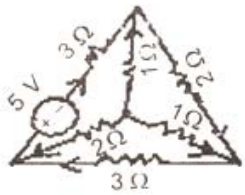


Fig. 3 (a)

(b) Determine the the values R, L and C in a series RLC circuit that resonates at 2 kHz and consumes 100 W from a 100 V AC source operating at the resonance frequency. The bandwidth is 0.75 kHz. Find the half power frequencies. 5

4. (a) In the network shown fig. 4 (a) the capacitor C has an initial voltage $V_c = 10$ V and at the same instant, the current through the inductor L is zero,

the switch S is closed at time t = 0. Find out the expression for the voltage v(t) across the inductor. 5

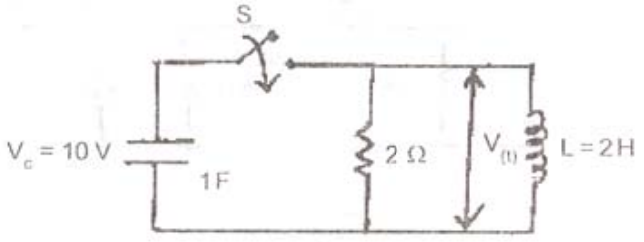


Fig. 4(a)

(b) In the two mesh network shown in Fig. 4(b) below, there is no initial charge on the capacitor. Find the loop currents $i_1(t)$ and $i_2(t)$ which results when the switch is closed at t = 0 ? (use Laplace transform) 5

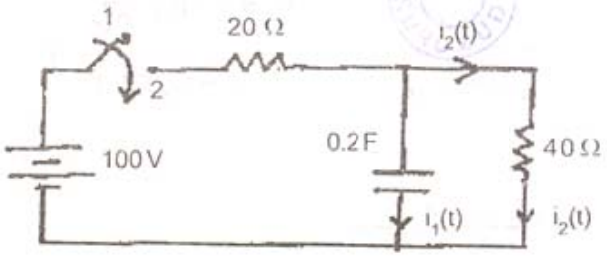


Fig. 4(b)

5. (a) Determine the Fourier transform of this v(t) shown in Fig. 5(a) and also sketch the continuous amplitude and phase spectrums of this v(t). 5

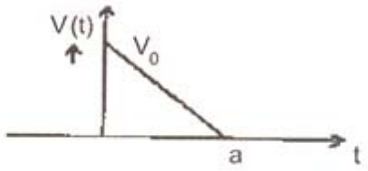


Fig. 5(a)

(b) Find the inverse Laplace transform of the function given below : 5

$$\frac{12}{(s+2)^2(s+4)}.$$

6. (a) Calculate the Y parameters for the network shown in Fig. 6(a). 5

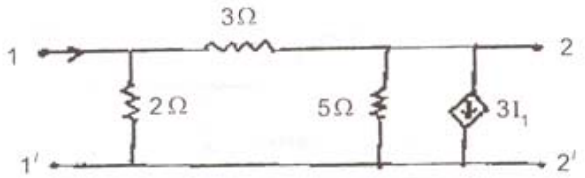


Fig. 6 (a)

(b) Examine whether the network function $F(s) = \frac{3s^3 + s^2 + 2s + 4}{(s+2)(s+4)}$ is positive real. 5

7. (a) Realize the function $Y(s) = \frac{s(s+3)}{6(s+2)(s+4)}$ Cauerl form. 5

(b) Realize the network function given by $F(s) = \frac{(s+1)(s+3)}{s(s+2)}$ in the Foster–I form. 5

8. Write short notes on any **two** : 5×2

(a) Tellegen's theorem

(b) Restriction on location of Poles and Zeros

(c) Positive Real Function and explain its properties.