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Total number of printed pages – 4

B. Tech
BEES 2211/BEEE 2211

Third Semester Examination – 2012-13

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 'Twigs' ? Briefly explain by a diagram.
 - (b) State and explain Maximum Power Transfer Theorem.
 - (c) What do you mean by Coefficient of Coupling ? Explain.
 - (d) What is the initial and final values of $V(t)$ for $V(s) = \frac{s+2}{s(s+1)}$?
 - (e) Mention the properties of RC driving point impedance.
 - (f) Laplace transform of a function $F(t)$ is given as $\frac{6s^2 + 8s + 3}{s(s^2 + 2s + 5)}$. Find $F(0)$ and $F(\infty)$.
 - (g) A two port device is defined by the following pair of equations
 $I_1 = 5V_1 + 2V_2$, $I_2 = 3V_1 + 4V_2$. Write its impedances parameter Z_{11} , Z_{12} , Z_{21} , Z_{22} .
 - (h) In a given RL type high pass filter $R = 3\text{ K}\Omega$ and $f_c = 2000\text{ KHz}$. Find out the value of L .
 - (i) What is Dirichlet Conditions ? Explain briefly.
 - (j) Check whether $F(s) = \frac{s+2}{s+1}$ is a positive real function or not.

P.T.O.

2. (a) Two coupled coils have self inductance $L_1 = 15 \times 10^{-3} \text{ H}$ and $L_2 = 20 \times 10^{-3} \text{ H}$. The coefficient of coupling (K) being 0.75 in the air, find the voltage in the second coil and flux of first coil provided the second coil has 500 turns and the circuit current is given by $i = 2 \sin 314t \text{ A}$. 5
- (b) For the network shown in figure 2 (b), draw the oriented graph and obtain the tie set matrix. Also use this matrix to calculate the current I flowing in 3Ω resistor. 5

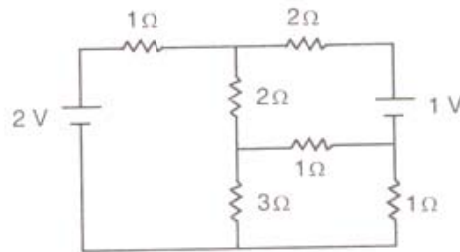


Fig. 2 (b)

3. (a) For the network shown in fig. 3 (a) below Write the f-cut set matrix and hence obtain the equilibrium equations on node basis. Choose AC & BC as twigs. 5

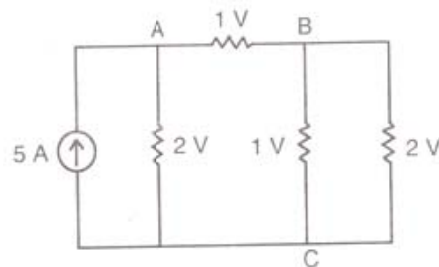


Fig. 3 (a)

- (b) Derive the expression for the resonant frequency for the parallel circuit shown in the Fig. 3 (b) below. If $R = 25 \Omega$, $L = 0.5 \text{ H}$, $C = 5 \mu\text{F}$, find ω_0 , Q , and the bandwidth of the circuit. 5

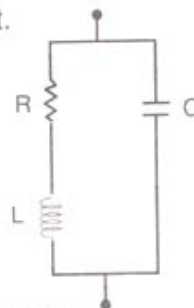


Fig. 3 (b)

4. (a) In the network shown fig. 4(a) the switch is closed and a steady state is reached in the network. At $t = 0$ switch is opened. Find the expression for the current $i(t)$ through the inductor. 5

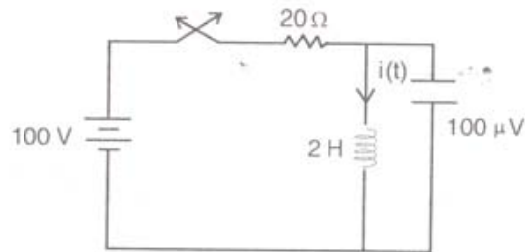


Fig. 4(a)

- (b) The response of a network to an impulse function is given by $0.25 (e^{-0.5t} - e^{-2.5t})$. Determine the response of the network to a step function. 5
5. (a) Determine the fourier series of the saw tooth waveform in the Fig 5 (a) Given below and also sketch the frequency spectrum. 5

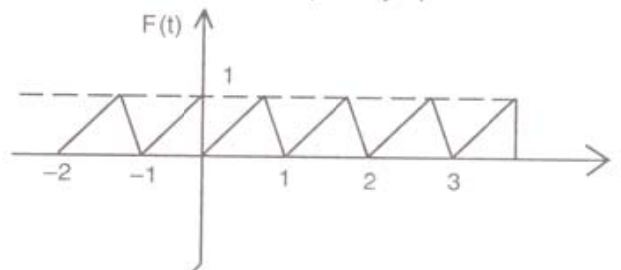


Fig. 5 (a)

- (b) Explain clearly the difference between Fourier transform and Laplace transform and also discuss briefly their importance in analyzing the electrical networks. 5
6. (a) Find the transmission parameters for the two port network in the fig 6 (a) given below. 5

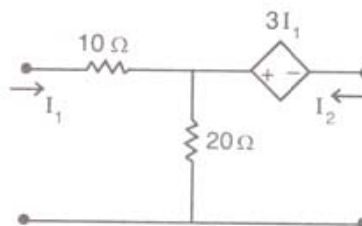


Fig. 6(a)

- (b) The Z parameters of a two port network are given by, $Z_{11} = (2s + 1/s)$, $Z_{12} = Z_{21} = 2s$, $Z_{22} = (2s + 4)$. Find the T-equivalent of the network. 3
- (c) Express Z parameter in terms of h parameter. 2
7. (a) Synthesize the impedance function $Z(s) = \frac{(s^2 + 1)(s^2 + 3)}{s(s^2 + 2)}$ in Cauer II form. 5
- (b) Realise the network function given by $F(s) = \frac{s(s + 1)(s + 3)}{s(s + 2)}$ in the Foster-II form. 5
8. Write short notes on any **two** : 5×2
- Incidence Matrix and its properties
 - Significance of poles and zeros
 - Fourier Transform and Fourier integral.