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

Total number of printed pages – 4

B. Tech

CPES 5201/BEEE 2211/BEES 2211(O/N)

Third Semester Examination – 2010

NETWORK THEORY
(Old and New Course)

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 in brief : 2×10

   (a) List the sets of information that can be derived from an incidence matrix as obtained from the graph of a network.

   (b) Justify that the efficiency of a network is 50% during maximum power transfer.

   (c) Give the expression for loop voltage in a closed loop of a network containing a time varying voltage source 'v (t)' as excitation. The circuit elements include a resistance 'R', an inductor with self inductance 'L' and mutual inductance 'M'.

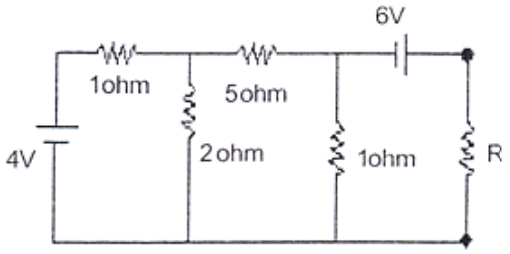
   (d) Find the Laplace Transform of the functions : $f(t) = e^{at}$ and $f(t) = e^{-at}$.

   (e) For a two port network, give the expression for y-parameters in terms of h-parameters.

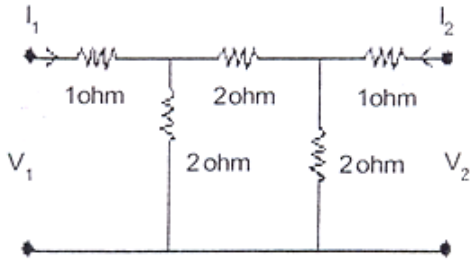
   (f) Explain the term "Coefficient of Coupling" and narrate its significance for coupled circuits.

P.T.O.

(g) Find the value of 'R' in the network given below for maximum power transfer.



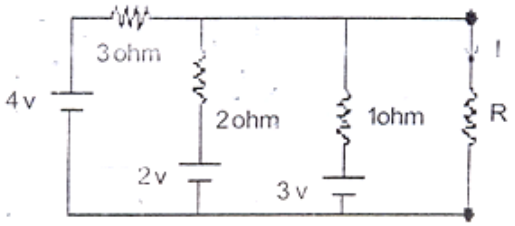
(h) Obtain the z-parameters for the network shown below :



(i) List three properties of Fourier transforms.

(j) Explain why non-linear systems cannot be analyzed by Laplace transform method?

2. (a) In the circuit shown below find the value of current 'I' through the load by applying Millman's theorem assuming load resistance 'R' of 5 ohm. 5



(b) State and explain the Tellegens's theorem and its applicability. 5

Or

State and explain the Reciprocity theorem and its applicability. 5

3. (a) Find the inverse Laplace transform of the function given by $F(s) = \frac{12}{(s+2)^2(s+4)}$. 5

(b) What do you mean by positive-real function ? By applying continued fraction expansion examine whether a given function $A(s) = 4s^6 + 3s^5 + 2s^4 + 5s^3 + 2s^2 + 3s + 4$ is Hurwitz ? 5

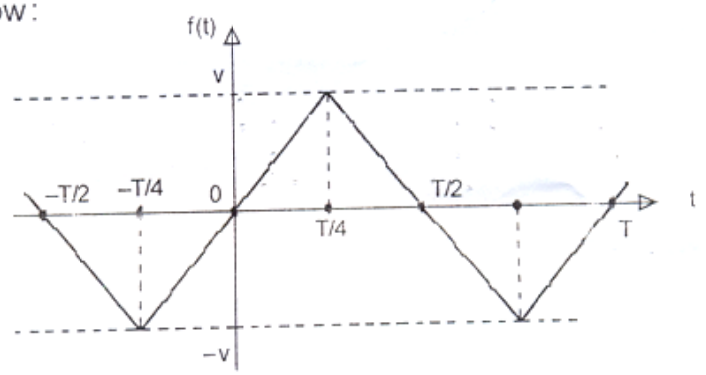
4. (a) In a R-L-C series circuit, the resistance, inductance and capacitance values are 2Ω, 1 H and 0.5 F respectively. The circuit is excited with the help of a switch from a DC source of 50 V having negligible internal resistance. By applying Laplace Transform method find the current i(t) in the circuit, if the switch is closed at t = 0. 5

(b) Derive the expression for resonant frequency for R-L-C series circuit. How does this differ from the resonant frequency of an R-L-C parallel circuit ? 5

5. What do you mean by network synthesis ? The network function for a given network is given by $(s) = \frac{s(s+2)}{(s+1)(s+3)}$. Realize the network function in Foster-II form and show the network connections in a neat diagram. 10

6. Explain the functionalities of transmission parameters for two port networks. Also derive the inter-relation between transmission parameters and z-parameters. Given that the z-parameters of a two port network are presented as $z_{11} = 10\Omega$, $z_{12} = z_{21} = 5\ \Omega$, and $z_{22} = 20\Omega$, find the values of transmission parameters for the same network. 10

7. Find the Fourier series for the function whose periodic waveform is shown in the figure below: 10



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

(a) Resonant frequency, Band width, Quality Factor and their interrelation.

(b) Derive the condition for maximum power transfer in a complex network.

(c) Time domain behavior from pole-zero plots.