[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
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B. Tech 3rd Semester Examination

Circuit Theory (O.S.)

EE(ID)-3001

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, by selecting atleast one question from each of sections A, B, C and D, question no. 9 of section E, which is compulsory. All questions carry equal marks.

SECTION - A

1. (a) A half cycle sine wave function is given by

v(t)=sin wt. Determine its Laplace transform.

(b) In Fig. 1, the battery voltage is applied for a steady state period. Obtain the complete expression for the circuit after closing the switch K. **(20)**

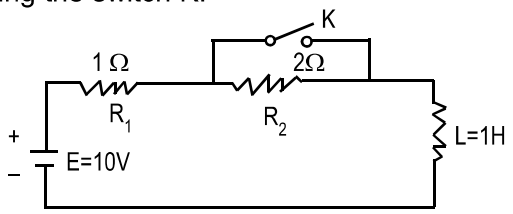

Fig. 1

2. A voltage wave is shown in Fig. 2.

(a) Find exponential Fourier series for the wave.

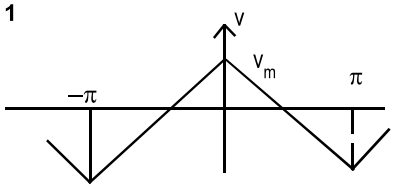

Fig. 2

(b) If this wave is applied to a series combination of resistance (R) and capacitor (C) find current.

(c) Find power and power factor of the circuit. **(20)**

SECTION - B

3. Obtain I and II equivalent circuits for the network of Fig. 3 by using impedance and admittance parameters respectively. **(20)**

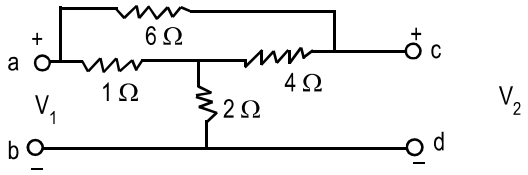

Fig. 3

4. (a) Derive the condition of reciprocity and symmetry in h-parameter network.

(b) Find the y-parameters for the network of Fig. 4. **(20)**

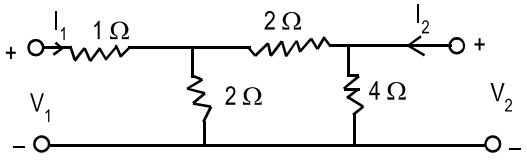

Fig. 4

SECTION - C

5. Fig. 5 represents a resistive network. Determine the numbers of branches, number of nodes and links. Write down the incidence matrix for the given network. Also develop the network equilibrium equation. **(20)**

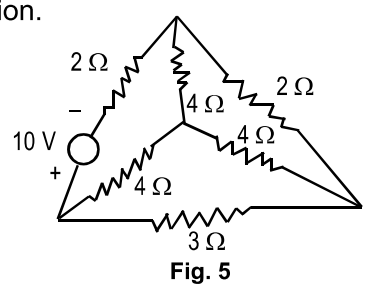

Fig. 5

6. (a) Write the loop equations in time domain and s domain, if $L_1=L_2=2H$, $V_1=5$ Sin wt, $V_2=5$ sin (wt+30°)

M=10H for the circuit of Fig. 6.

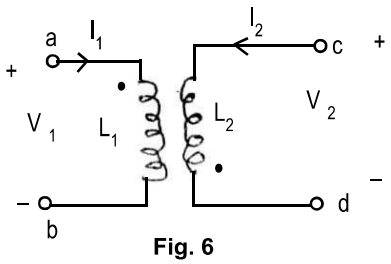

Fig. 6

(b) For an ideal transforming find the input impedance. Assume load impedance to be Z_2. **(20)**

SECTION - D

7. Check whether the following function is Hurwitz

(a) $s^5+14s^4+48s^3+200s^2+500s+200=0$

(b) Represent $z(s)=\dfrac{s^4+7s^2+9}{s(s^2+4)}$ in the form of Cauer LC network **(20)**

8. (a) Driving point impedance of an LC network is given by

$$z(s)=\frac{10s^4+12s^2+1}{2s(s^2+1)}$$

determine the first foster form.

(b) Find the second foster form of the admittance function given by

$$y(s)=\frac{s(s^2+9)}{10(s^2+4)\,(s^2+25)}$$ **(20)**

[P.T.O.]

SECTION - E (Compulsory)

9. (a) Find the Laplace transform of shifted step function.

(b) Describe z and y parameters.

(c) What is non-linear circuit? Can Ohm's law be applied to a non-linear circuit?

(d) How can you obtain a fundamental Tie set matrix?

(e) What is the importance of poles and zeros?

(f) What is initial and final value theorems?

(g) What is waveform symmetry?

(h) What are properties of a transfer function?

(i) Define co-efficient of coupling.

(j) List four important properties of a driving point impedance function of an LC network. **(10×2=20)**