B. Tech Second Year : 3rd Semester

Circuit Analysis & Synthesis, Jan., 2012

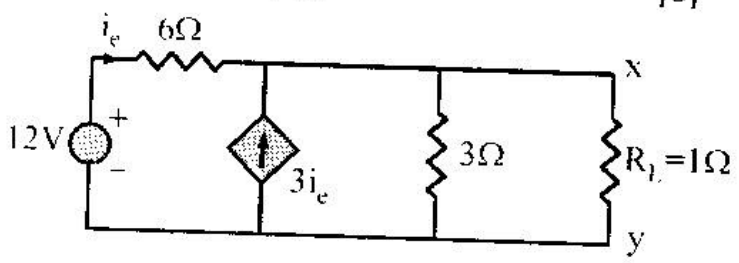
(FOR 3EC3 BRANCH OF ENGINEERING)

Times : 3 Hours | **Min. Passing Marks : 24** | **Total Marks :**

*Attempt overall **five** questions in all. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Unit–'I'

1. (a) Calculate the current through R_L in the following circuit using Norton's Theorem. [8]



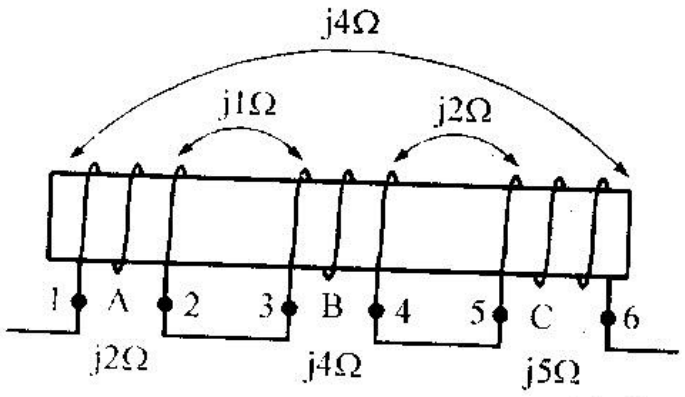
(b) Explain Reciprocity theorem in detail with suitable example. [8]

OR

1. (a) What is Coupling Coefficient ? Derive the relation for coupling coefficient in terms of self inductance and mutual inductance.

(b) Write short note on inductively and conductively coupled circuits.

(c) Draw the dotted equivalent of the circuit shown below and find the equivalent inductive reactance:



[4+6+6]

Unit–'II'

2. (a) Explain different types of functions used in transient analysis. [4]

(b) Explain initial value and final value theorem. [6]

(c) A series circuit of resistance 10Ω and inductance 0.1 H is connected across a 50 Hz sinusoidal voltage of maximum value 200 V.

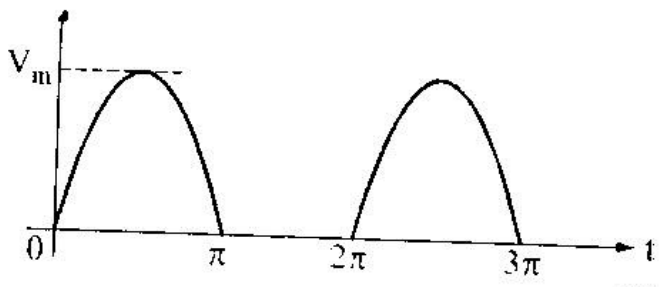
(i) Find an expression for the value of current at any instant after the voltage is applied, assuming that the voltage is zero at the instant of application.

(ii) Calculate the value of current 0.02 sec. after switching on. [6]

OR

2. (a) Explain different kinds of Symmetry in non-sinusoidal waves. [8]

(b) Determine the Fourier series for the half-wave rectified voltage waveform shown below.



[8]

Unit–'III'

3. (a) Check whether the following polynomial is Hurwitz or not. $P(S) = s^4 + s^3 + 2s^2 + 4s + 1$ [6]

(b) Apply the Routh-Hurwitz criterion to the following polynomial $P(S) = s^4 + 2s^3 + 8s^2 + 10s + 15$ and determine:

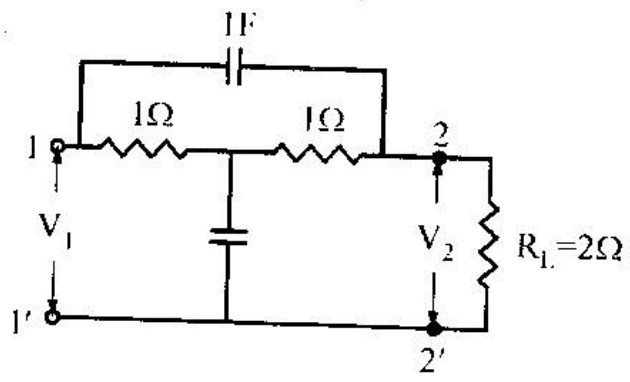
(i) the number of roots with positive real parts.

(ii) the number of roots with zero real parts and

(iii) the number of roots with negative real parts. [10]

OR

3. (a) Determine the driving point admittance and transfer admittance for the bridged T-network shown below with a 2Ω load resistor connected across port 2.



[8]

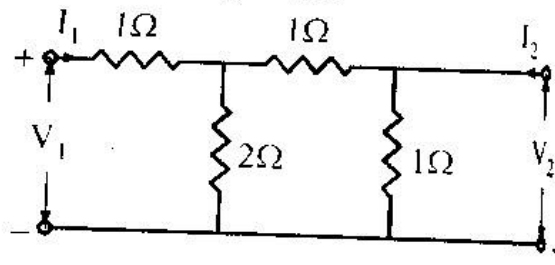
(b) Write down the properties of Positive Real Function. Also find the positive realness of the following function.

$$Z(s) = \frac{\left(2s^2 + 5\right)}{s\left(s^2 + 1\right)}$$ [8]

Unit–'IV'

4. (a) Derive the condition of symmetry in two port parameter for h-parameter. [6]

(b) Explain image impedance Calcul the values of image impedance of following circuit.

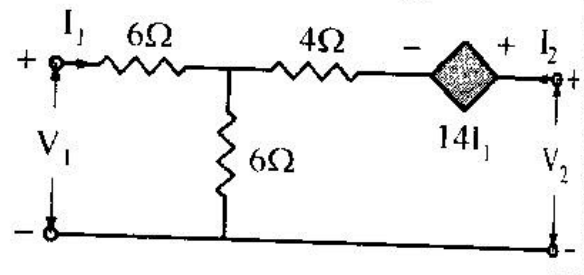


[10]

OR

4. (a) Explain the cascade connection of two two-port networks. The ABCD parameters of a two-port network 'A' are A = 2, B = 3, C = 1, D = 4 and h-parameters of a two-port network 'B' are $h_{11} = 2$, $h_{12} = 3$, $h_{21} = 1$, $h_{22} = 4$. If both of these two-port networks are connected in cascade, calculate the ABCD parameters of the overall cascaded two-port network. [10]

(b) Find the z-parameters of the following two port network. Also prove that the y-parameter of this network does not exist.



[6]

Unit–'V'

5. (a) An impedance function is given by

$$Z(s) = \frac{\{(s+1)(s+4)\}}{\{s(s+2)(s+5)\}}$$

Find :

(i) Foster First Form

(ii) Foster Second Form [8+8]

OR

5. (a) Synthesize Z(s) in Cauer Second Form

$$Z(s) = \frac{8s^3 + 10s}{s^4 + 6s^2 + 5}$$

(b) Find Cauer First Form for an admittance function

$$Y(s) = \frac{(s+4)(s+6)}{(s+3)(s+5)}$$ [8+8]