1340

B. Tech 3rd Semester Examination

Circuit Theory and Network Analysis & Synthesis (N.S.)

EC-213

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.
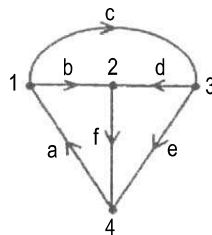
Note : Attempt five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. For the circuit shown below find the numerical value of current i_1 using nodal analysis method.

(20)
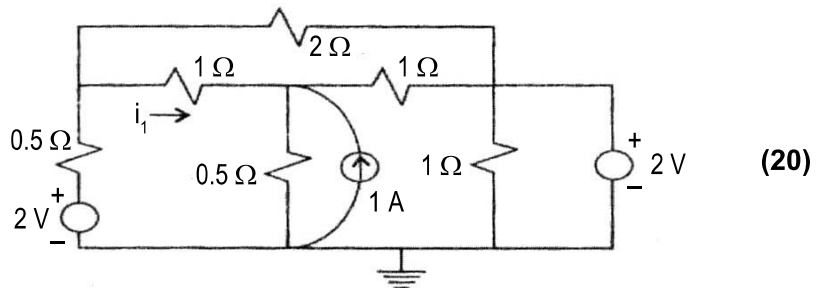
2. For the graph shown in the given figure, Find the

    (i) Twigs   (ii) Links

    (iii) Fundamental cutset   (iv) Fundamental loop   (20)

SECTION - B

3. The response of a system to an impulse is given by

    h(t)= 0.18 [exp (–0.32t) – exp (–2.1t)]
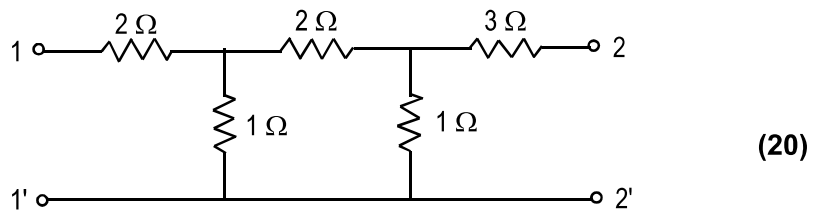
    Find the response of the system to the unit step function. **(20)**

4. In a series RLC circuit, R = 2 kΩ, L = 1 mH, and C=1/400 µF. If a voltage of 100V is applied across the series combination then determine the

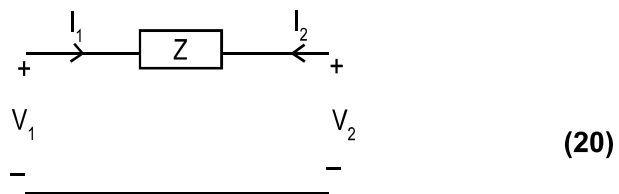   (i) Resonant frequency   (ii) Q factor   (iii) Half power frequencies   **(20)**

SECTION - C

5. Find the admittance parameters of the two-port network in the figure shown below.

(20)

6. Find the hybrid parameters of the two-port network in the figure shown below.

(20)

SECTION - D

7. Check the positive realness of the following function?

    $$\frac{s^2 + s + 6}{s^2 + s + 1}$$

    (20)

8. A designer require to synthesize a network with the following data:

   (i)   Impedance function has simple poles at –2 & –6.

   (ii) Impedance function has simple zeros at –3 & –7.

   (iii) Z(0) = 20

   Is it possible to synthesize it? Give reasons. Hence find one Cauer-I & Foster-I Representations. **(20)**

SECTION - E

9. (a) Kirchoff s law is applicable for linear as well as non linear circuits? Justify your answer by taking a suitable example.

   (b) What is Vo across resistance R_1= 1KΩ if all the voltage sources are ideal in the circuit shown?
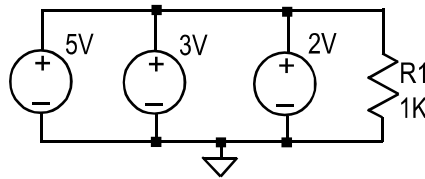
   (c) Find the maximum power that can be transferred to the load resistor R_L from the voltage source in the figure shown below?
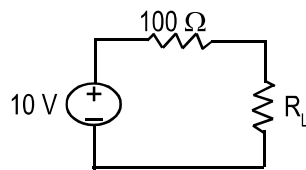
   (d) The Laplace transform of i (t) is given by

   $$I(s) = \frac{2}{s(1+s)}$$

   At t → ∞ the value of i (t) tends to?

(e)   A series RLC circuit has a resonance frequency of 1 KHz and a quality factor Q = 100. If each of R, L and C is doubled from its original value, then what is the new Q of the circuit?

(f)   What is the significance of Q factor?

(g)   Why there is need of the analysis of two port networks using various parameters?

(h)   What is the condition of reciprocity in Z-parameters?

(i)   State necessary and sufficient condition for positive real functions (prf).

(j)   Test whether the following polynomial is Hurwitz.

$$s^4 + 7s^3 + 6s^2 + 21s + 8$$ **(2×10=20)**