



RM-6481

B. E. II (Sem. IV) (EL & ECC) Examination

May / June - 2010

Electrical Network : Paper - II

Time : Hours]

[Total Marks :

Instruction :

(1)

नीचे दशांशके निशानीवाणी विगतो उत्तरवही पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
← B. E. 2 (Sem. 4) (EL & ECC)	<input type="text"/>
Name of the Subject :	<input type="text"/>
← Electrical Network : Paper - 2	<input type="text"/>
← Subject Code No. : <input type="text"/> 6 <input type="text"/> 4 <input type="text"/> 8 <input type="text"/> 1 ← Section No. (1, 2,.....): <input type="text"/> 1&2	<input type="text"/>
	Student's Signature

- (2) Attempt all questions.
- (3) Answers to the two sections must be written in **separate** answer books.
- (4) Assume appropriate data and give neat sketches wherever **necessary**.
- (5) Numerical figures to the **right** indicate full marks.
- (6) Scientific calculators upto series Fx-82, MS, Fx-991 MS are allowed.

SECTION - I

- 1 (a) (i) Explain following terms with suitable examples: 4
(a) loop (b) tree
(c) Node (d) Fundamental cutset.
- (ii) Derive the expression of current and voltage in 3
Series R-L Circuit with D.C. Supply.
- (iii) Derive symmetrical component equation. 3
- (b) Derive the relationship between positive sequence 6
component of line voltage and the phase voltage of an
unbalanced star connected load.
- (c) Discuss the significance of zero sequence components 5
and also explain existence of zero sequence components
in different types of three phase systems.
- 2 (a) For the network shown in figure 1 below
- (i) Draw oriented graph 3
- (ii) Write Cutset Schedule 3
- (iii) Obtain current through and voltage across 9
each element.

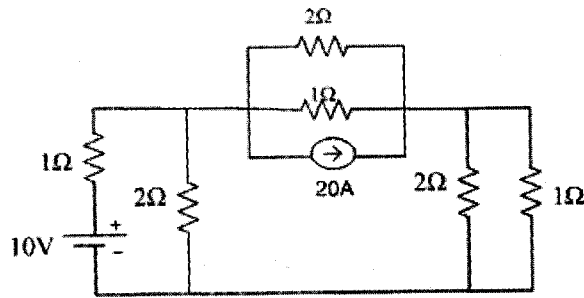


Fig.1

OR

- 2 (a) For the network shown in figure 2 below
- (i) Draw oriented graph 3
 - (ii) Write Tie-set schedule 3
 - (iii) Obtain current through and voltage across each element. 9

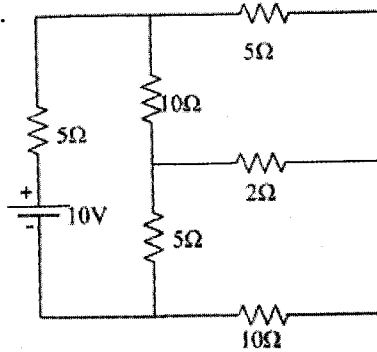


Fig 2

- 3 (a) Derive the expression of Y parameters in terms of ABCD parameters. 5
- (b) A series R-L-C circuit is shown in figure 3. Switch is closed at $t=0$. Find expression for current for $t \geq 0$. 10

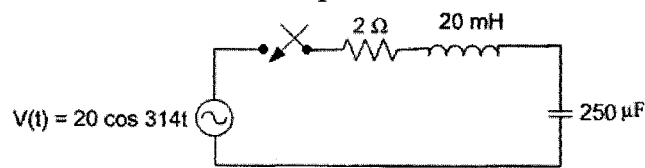


Fig. 3

OR

- 3 (a) A series R-C circuit is shown in figure 4. Switch is closed at $t=0$. Find expression for current for $t \geq 0$. Capacitor is initially charged to $q_0 = 1250 \mu\text{C}$. 10

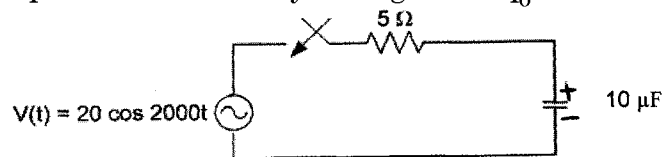


Fig. 4

- (b) Derive the expression of Z parameters in terms of hybrid parameters. 5

SECTION - II

- 4 (a) Do as directed : 10
 (i) Whether the following expression for driving point impedance $Z(s)$ is suitable for representing a passive on-port network is correct or not? Justify your answer. 2

$$Z(s) = \frac{s^2(s^2 - 2s + 6)}{(s + 3)}$$

- (ii) What is separation property of purely reactive network. 2
 (iii) Find the driving point admittance $Y_{11}(s)$ of given network. 2

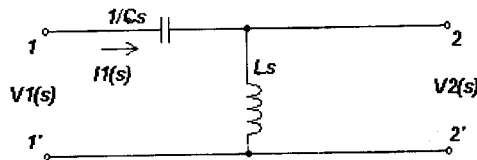


Fig. 5

- (iv) Define band pass filter. 2
 (v) Physical interpretation of pole and zero of purely reactive network can be realized as _____ circuit and _____ circuit respectively. 1
 (vi) In driving point function, poles and zeros, if complex they must be in _____. 1
 (b) For symmetrical π network prove that $\tan hr = \sqrt{Z_s/Z_0}$, where all the terms have their usual meanings. 5
 (c) Write short note on m-derived low pass filter for T and π sections. 5
 5 (a) (i) Write a short note on Foster's first form and derive expressions for all elements. 4
 (ii) The driving point admittance of a one port L-C network is given by, 3

$$Y(s) = \frac{3s(s^2 + 16)}{(s^2 + 1)(s^2 + 25)}$$

Obtain the first Foster form of equivalent network.

OR

- 5 (a) (i) Write a short note on Foster's Second form and derive expressions for all elements. 4
 (ii) The driving point admittance of a one port L-C network is given by 3

$$Y(s) = \frac{3s(s^2 + 16)}{(s^2 + 1)(s^2 + 25)}$$

Obtain the Second Foster form of equivalent network.

- (b) (i) Prove that in constant-k high pass filter, the lower cutoff frequency is given by $f_c = \frac{1}{4\pi\sqrt{LC}}$. 4
- (ii) Design constant-k high pass T and π section filter having cut off frequency of 6 kHz and nominal characteristic impedance $R_0 = 600\ \Omega$. 4

OR

- (b) (i) Write a short note Constant K-filters. 4
- (ii) Design k-type band pass filter having a design impedance of 500 Ω and cut off frequencies 1 kHz and 10 kHz. 4

6 Attempt any **three** : 15

- (i) The driving point impedance of an LC network is given

$$\text{by } Z(s) = \frac{10s^4 + 12s^2 + 1}{2s^3 + 2s}$$

For this impedance function

- (a) determine the First Caueer configuration and
 (b) determine the value of each element in the network.
- (ii) The driving point impedance of an LC network is given

$$\text{by } Z(s) = 2 \frac{s(s^2 + 9)}{(s^2 + 1)(s^2 + 25)}$$

Obtain the locations of poles and zeros. Plot pole-zero configuration and also the reactance $X(\omega)$ as a function of frequency ω .

- (iii) Derive expressions for circuit elements of constant-k band pass filter for given values of nominal characteristic impedance and cut-off frequencies f_1 and f_2 .
- (iv) The driving point impedance of an LC network is given

$$\text{by } Z(s) = \frac{s^4 + 10s^2 + 2}{s^3 + 4s}$$

For this impedance function, (i) determine the Second Caueer configuration and (ii) determine the value of each element in the network.

- (v) For the following network, determine the complex locus for the voltage ratio.

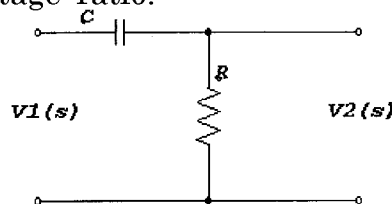


Fig. 6