* R N - 6 2 2 3 / 1 0 0 *

RN-6223

B. E. - II (Sem. - III) (I & C) Examination

May / June – 2010

Electrical Circuit Theory

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 2 (SEM. - 3) (I & C)

Name of the Subject :

☛ ELECTRICAL CIRCUIT THEORY

☛ Subject Code No. : 6 2 2 3 ☛ Section No. (1, 2,.....) : 1&2

Seat No. :

Student's Signature

(2) Attempt all questions.
(3) Answer to the two sections must be written in separate answer book.
(4) Assume necessary data and give sketches whenever necessary.
(5) Use the graph paper and semilog paper whenever necessary.
(6) Extreme right figures indicate full marks of the question.
(7) Scientific calculator FX-100W or equivalent students may use.

SECTION – I

1 (a) Do as directed :

(1) The input resistance of the network shown in **fig. 1** is : **2**

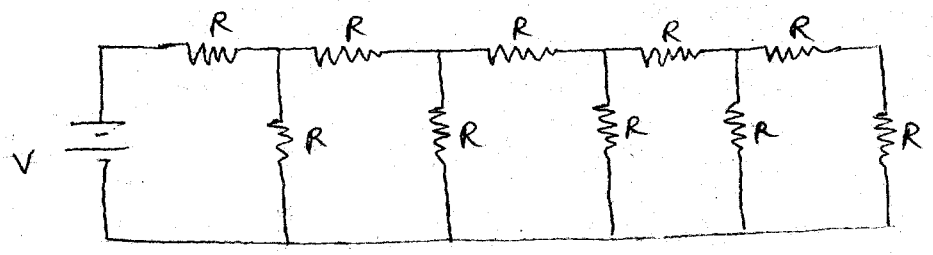


Fig. 1

(2) Explain superposition theorem. **2**

(3) KCL is a consequences of law of conservation of energy. (True / False) **1**

(4) Distinguish between dependent and Independent sources. **2**

(5) Match List - I with List - II : **3**

List - I (Network Theory)	**List - II** (Most Distinguish property of network)
(1) Reciprocity	(1) Impedance matching
(2) Tellagen's	(2) Bilateral
(3) Superposition	(3) $\sum_{k=0}^{b} V_k(t_1) i_k(t_2) = 0$
(4) Maximum power transfer	(4) Linear
	(5) Non Linear

(b) Using node voltage analysis obtain V_1 voltage for the network shown in **fig. 2**. **10**

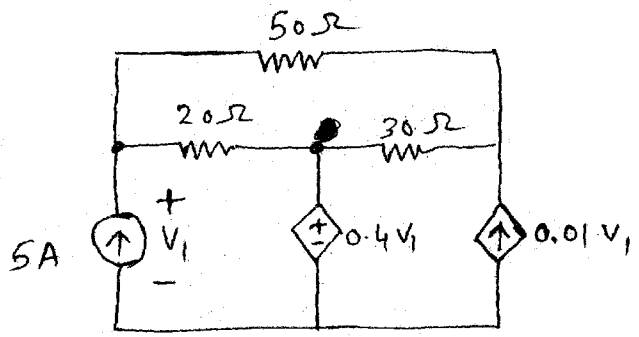


Fig. 2

2 (a) For the network shown in **fig. 3**, determine the current through the branch *AB*. **10**

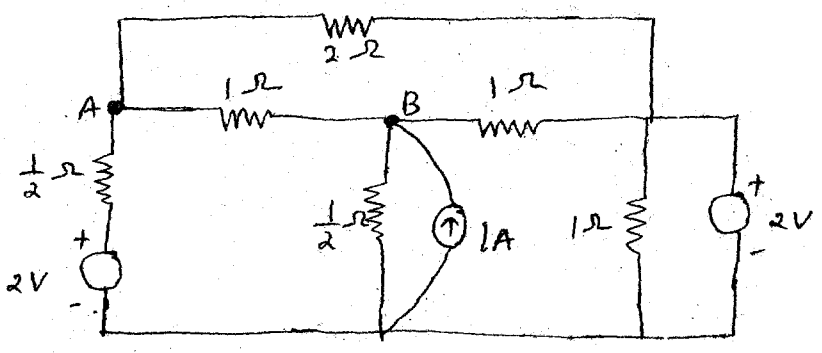


Fig. 3

(b) Determine the current i_x for the network shown in **fig. 4**. **5**

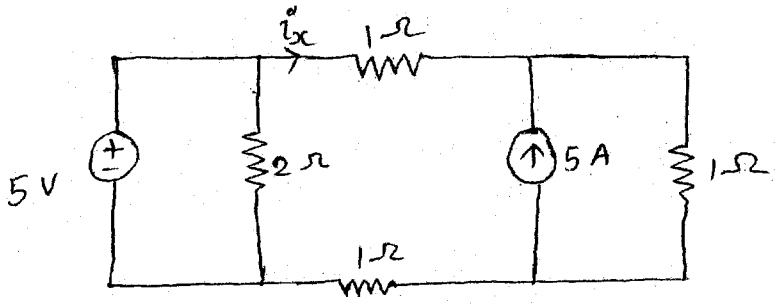


Fig. 4

OR

2 (a) For the network shown in **fig. 5** find the power consumed in each resistor and prove power supplied equal to power consumed using mesh current analysis. **12**

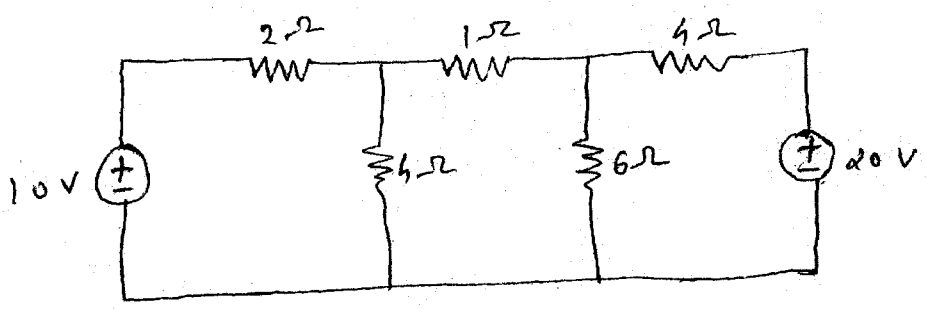


Fig. 5

(b) Explain Reciprocity theorem. **3**

3 Attempt any three out of following questions : **15**

(1) Explain the term mutual inductance and compare with self inductance of coil.

(2) What is duality ? How can be obtain dual of the network ? What is neat of duality.

(3) Obtain dual of the given network shown in **fig. 6**.

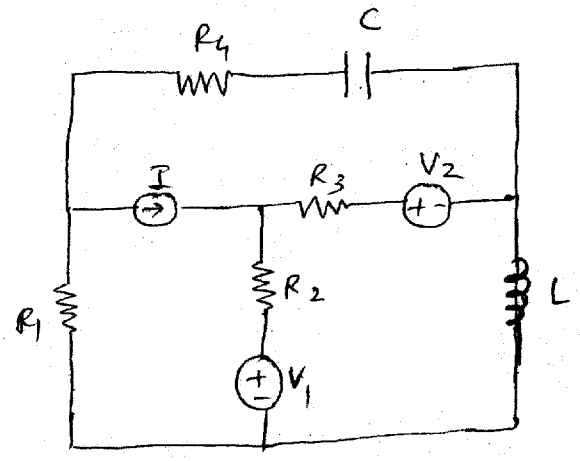


Fig. 6

(4) Find the equivalent inductance of the three series connected coupled coils shown in **fig. 7**.

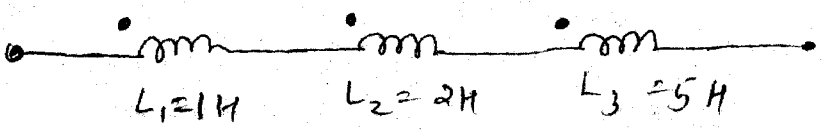


Fig. 7

(5) For the mutually coupled coils prove the mutual inductance $M = K\sqrt{L_1 L_2}$.

SECTION – II

Q-4(a) Attempt *ALL*. (Each question carries equal marks) **10**

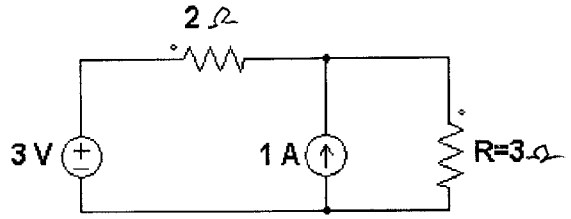
(1) Explain Dependent and Independent Energy sources.

(2) State and Explain Norton's theorem with suitable example.

(3) (a) Laplace Transformation of t^2 is _____

(b) Laplace Transformation of $\delta(t)$ is _____

(4) Find the current through Resistor R using Thevenin's theorem.



(5) Define and explain Initial Value Theorem.

Q-4(b) Prove that the Laplace Transformation of $f(t-a)*u(t-a)$ is given by $e^{-as}F(s)$. **5**

Q-4(c) Find Inverse Laplace Transformation of using Partial Fraction Expansion method. **5**

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

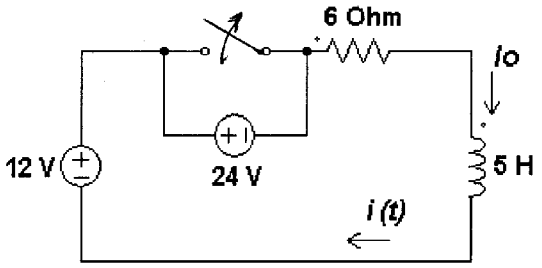
Q-5(a) **7**

For RLC circuit $Y(s)=\dfrac{s}{(s^2+6s+25)}$

Find

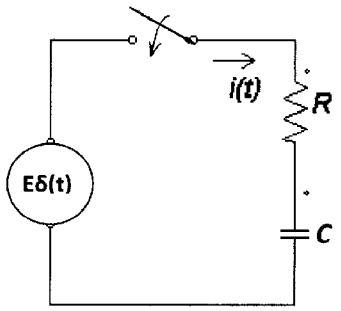
1) Damping factor
2) Damping ratio
3) Actual frequency of oscillation
4) Bandwidth
5) Q- factor
6) Half power frequency
7) Pole-zero location

Q-5(b) Find the current in the circuit shown in the figure below at an instant *t*, after opening the switch if a current of 1 A had been passing through the circuit at the instant of opening. **8**



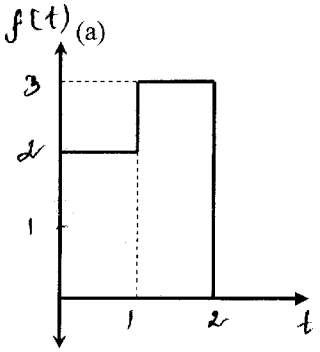
OR

Q-5(b) Draw and explain the Impulse response of series RC network using Laplace Transform. **8**



Q-6 Attempt *ANY* **THREE.** **15**

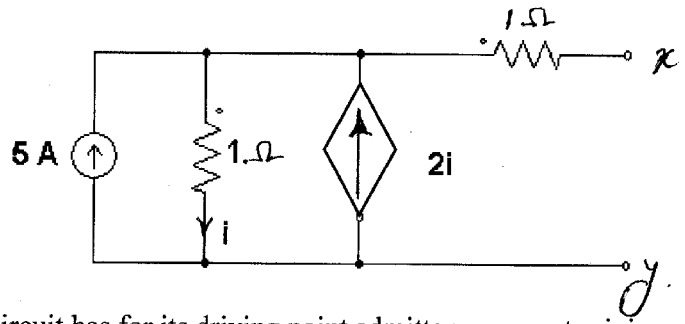
(1) Find the Laplace Transform of following waveform.



(b) Draw the waveform from wave equation

$$f(t) = 6a(t-t_1) + 2a(t-t_2) - 10a(t-t_3)$$

(2) In the circuit shown in figure below, find the Norton's equivalent at x-y terminals.



(3) A series RLC circuit has for its driving point admittance zero at origin and pair of conjugate poles at -1±j25. Write admittance function. Also, find the values of R, L and C.

(4) If $f_1(t) = 2u(t)$ and $f_2(t) = e^{-3t}u(t)$, determine convolution between $f_1(t)$ and $f_2(t)$.

(5) Using Thevenin's Theorem, Find current in 1 ohm Resistor.