* U H - 6 2 2 3 *

# UH-6223

## B. E. II (Sem. - III) (IC) Examination

### May/June – 2012

## 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) (IC)**

Name of the Subject :

☛ **Electrical Circuit Theory**

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

Seat No. :

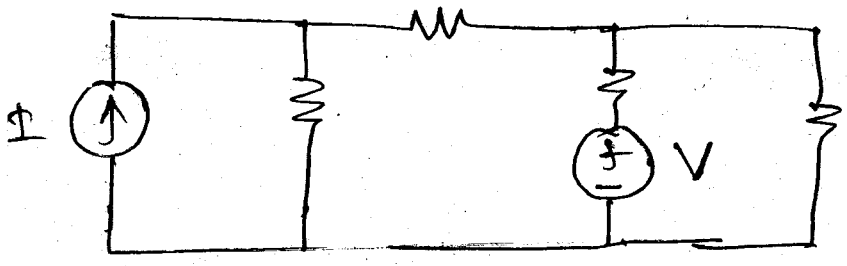
Student's Signature

(2) Attempt all questions.
(3) Assume necessary data whenever necessary.
(4) Extreme right figures indicate full marks of question.
(5) Scientific calculator FX-100 W or equivalent students may use.

**1** (a) Do as directed :

(i) A network is said to be non linear if it does not satisfy super position condition. (True/False). **1**

(ii) Draw the oriented graph and all the possible trees for the following network. **2**

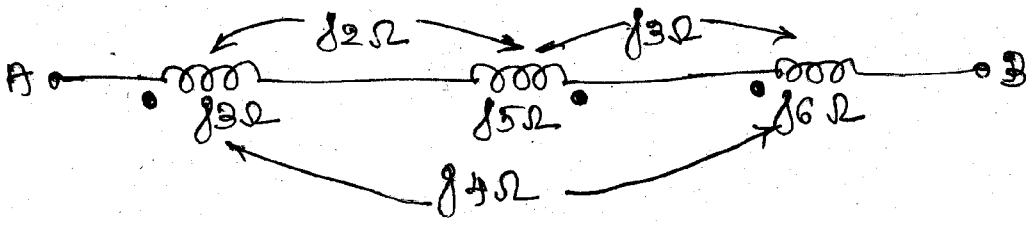



(iii) Distinguish between dependent and independent sources. **2**

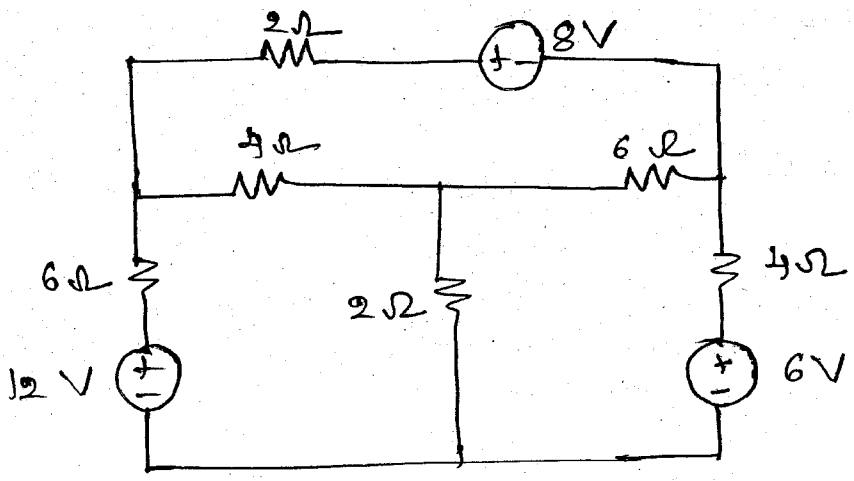
(iv) If the coefficient of coupling k=1, it is called perfect coupling. (True/false) **1**

(v) Explain maximum power transfer theorem. **2**

(vi) Find total inductance of the coil. 2

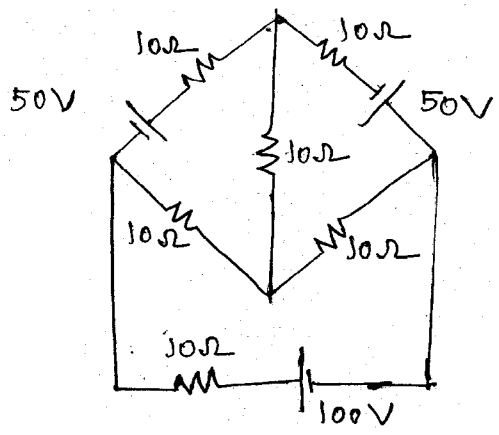



(b) For the network shown below draw the oriented graph, write the tie-set schedule and hence obtain all branch currents. 10




2 (a) State and explain dot rule for mutually coupled coils. 5

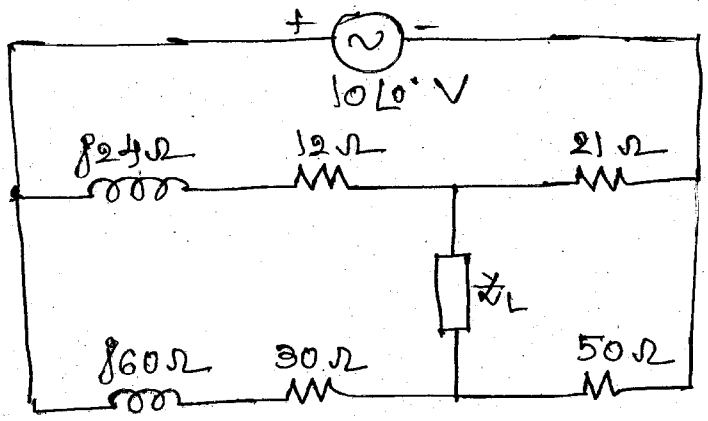
(b) Determine the current supplied by the 100 V battery for the circuit shown below. 10




**OR**

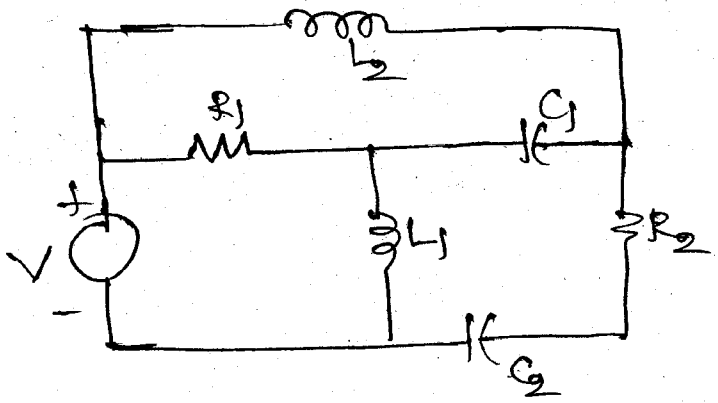
2 (a) Explain mesh analysis and nedal analysis as applied to electrical networks. 5

(b) For the network shown in fig. below, find the value of $Z_L$ so that the power transfer from the source is maximum. Also calculate $P_{max}$. **10**

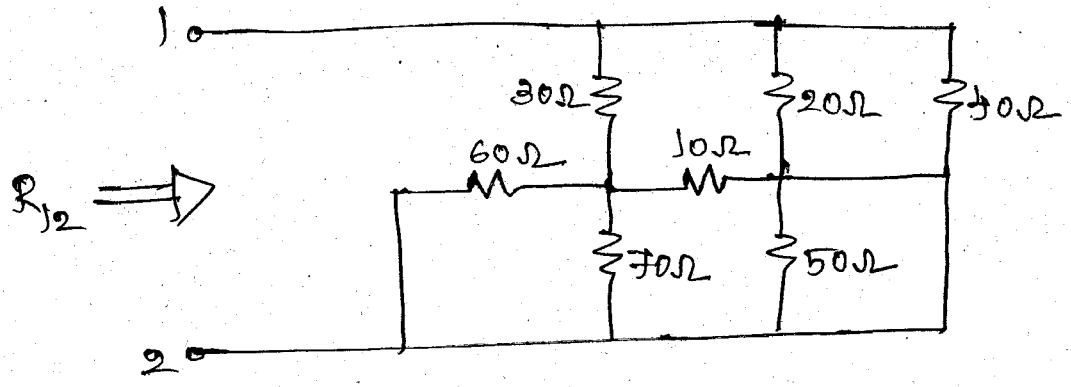



**3** Attempt any three : **15**

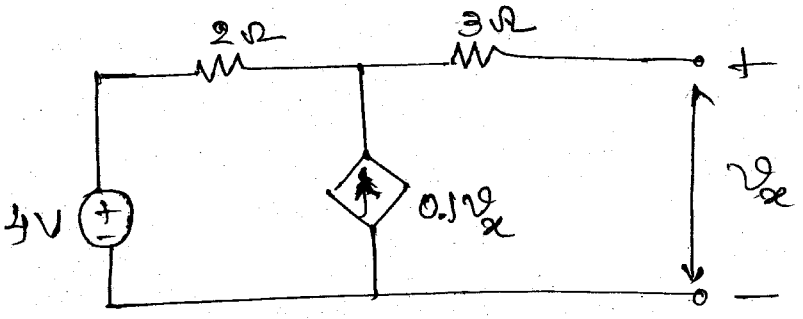
(a) Explain duality. Obtain the dual of the given network.




(b) Find the equivalent resistance as viewed from terminals 1-2.

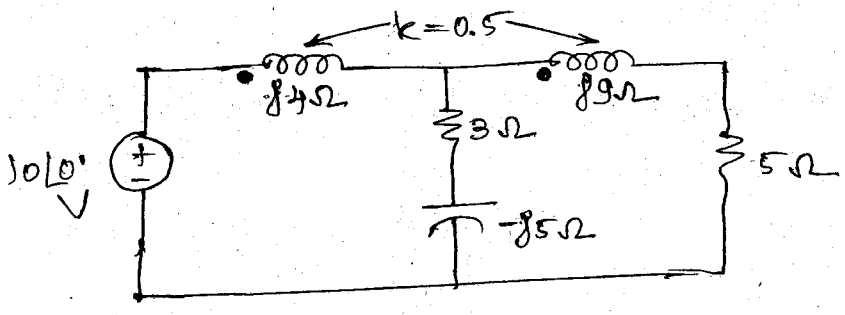


(c) Obtain Thevemin's equivalent circuit for the network given below.



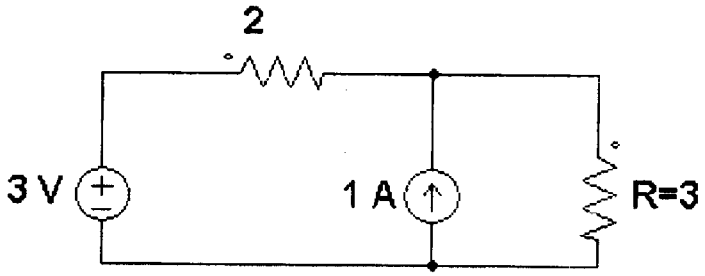

(d) Explain the term mutual inductance and compare with self inductance of coil.

(e) Find the voltage across 3-j5Ω branch for the given network.




4 (a) Attempt all (each question carries equal marks) **10**

(i) Find the current through Resistor R using Norton's theorem.



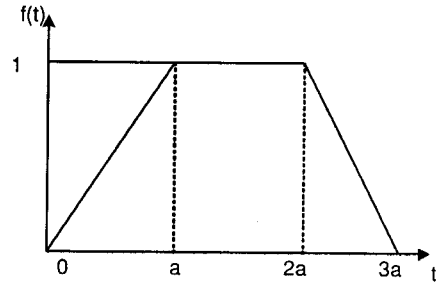

(ii) Define and explain Final Value Theorem.

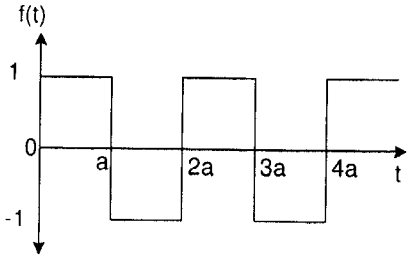
(iii) Find the laplace transformation of $f(t) = t^n$.

(iv) Find the laplace transformation of $f(t) = e^{-at}$.

(v) State and explain superposition's theorem with example.

(b) Obtain the laplace transform of the following waveform : **5**
(i) Non-recurring wave-form
(ii) Recurring wave-form




(c) Obtain inverse laplace of the following functions : **5**

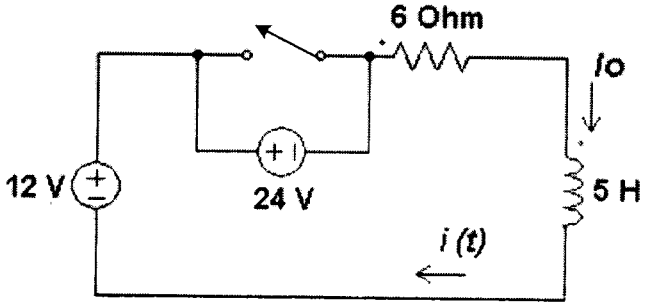
(i) $F(s)=\dfrac{s+5}{s\left(s^2+2s+5\right)}$

(ii) $F(s)=\dfrac{3s^2+4}{s\left(s^2+4\right)}$

**5** (a) For RLC circuit $Y(s)=\dfrac{s}{s^2+6s+25}$, find **7**

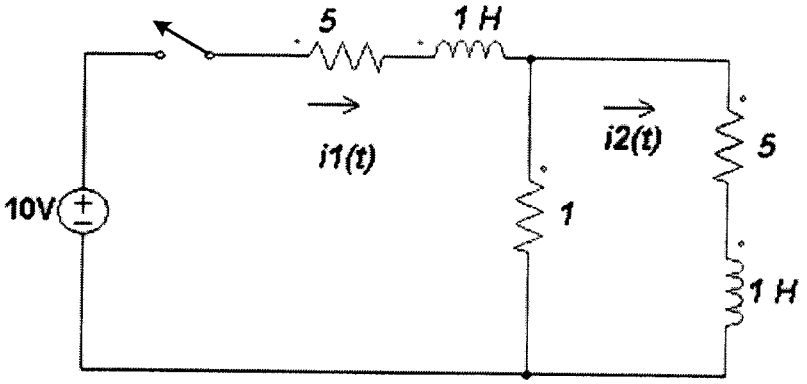
(i) Damping factor
(ii) Damping ratio
(iii) Actual frequency of oscillation
(iv) Bandwidth
(v) Q-factor
(vi) Half power frequency
(vii) Pole-zero location

(b) Find the current in the circuit shown in the figure below at an instant t, after opening the switch if a current of 0.5 A had been passing through the circuit at the instant of opening. **8**



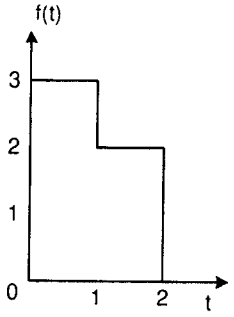

**OR**

(b) Using Laplace Transform, find $i_2(t)$ at t=0+following closing at t=0 of switch k. Assume initial conditions to be zero. 8




**6** Attempt any three : **15**

(i) (a) Find the Laplace Transform of following waveform.




(b) Draw the waveform from wave equation

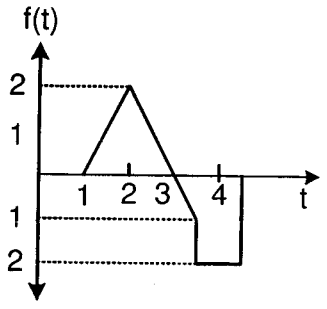
$$f(t) = 5u(t-t_1) + 1u(t-t_2) - 10u(t-t_3)$$

(ii) Define following and obtain its laplace transform

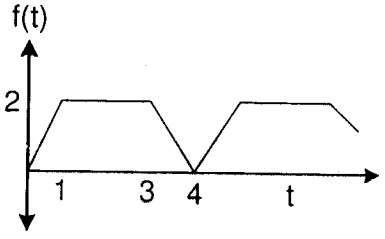
(a) Unit step function

(b) Unit impulse function

(iii) Find the Laplace Transform of following waveform.

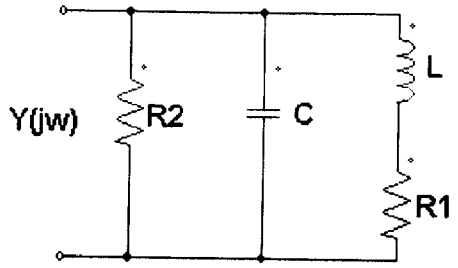



(a)




(b)

(iv) Draw the polar plot of the following circuit.




(v) Prove convolution theorem to determine inverse Laplace transform.