* K C - 6 2 2 3 *

KC-6223

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

November / December – 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 equilavent students may use.

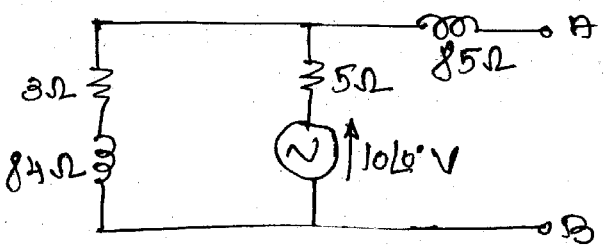
1 Do as directed :

(1) Distinguish between dependent and independent sources with suitable example. **4**

(2) State and explain superposition theorem. **4**

(3) State and explain dot rule for the coupled circuit. **4**

(4) The Thevenin equivalent impedance of the circuit in Fig is _____ . **4**



(5) State whether the following statements are true or false : **4**

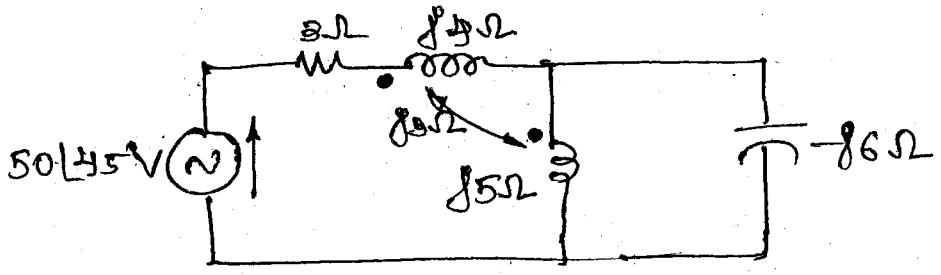
(i) Superposition theorem is valid only for linear circuits.

(ii) Superposition theorem is not applicable to networks containing transformers.

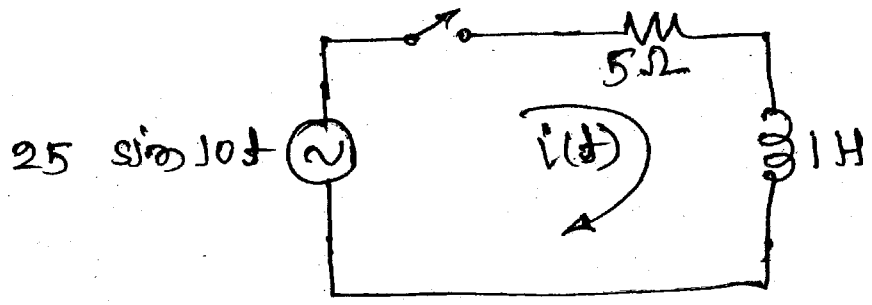
(iii) The maximum value of the coefficient of coupling is 100%.

(iv) The value of the coefficient of coupling K is more for air cored coupled circuits compared to the iron core coupled circuits.

2 (a) Find the voltage drop across capacitor for the following network. **7**

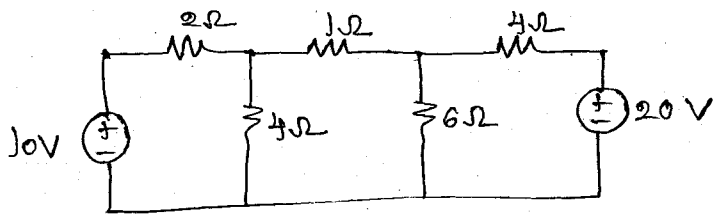


(b) For the circuit shown in Fig. a simusoidal voltage is applied at time t = 0 to a series R-L circuit. Determine the expression for current after closing the switch. **10**

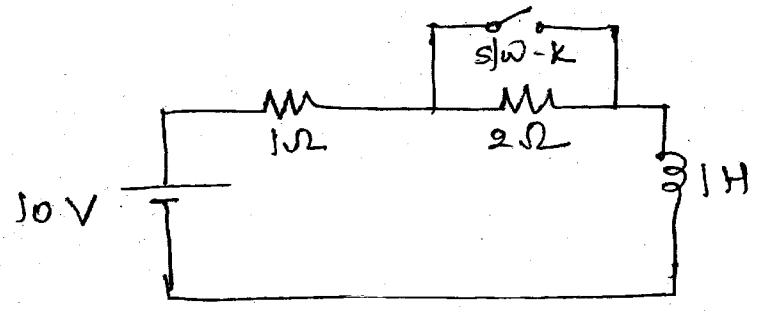


OR

2 (a) For the network shown in following Fig., find the power consumed in each resistor using mesh current analysis. **7**



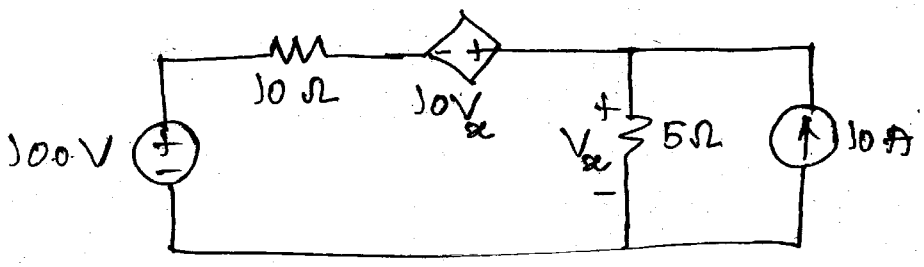
(b) In fig, the battery voltage is applied till steady state is achieved with S/W-K open. Obtain the complete expression for current after closing S/W-K. 8



3 Attempt any **three** : 15

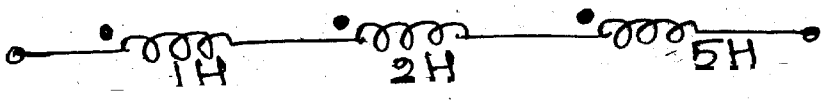
(a) What is duality ? How can we obtain dual of the network ?

(b) Find the current through 10 Ω resistor for the given network.

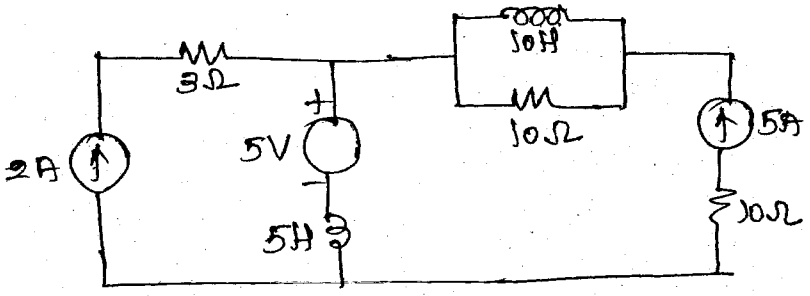


(c) For the mutually coupled coils, prove the mutual inductance $M = K\sqrt{L_1 L_2}$

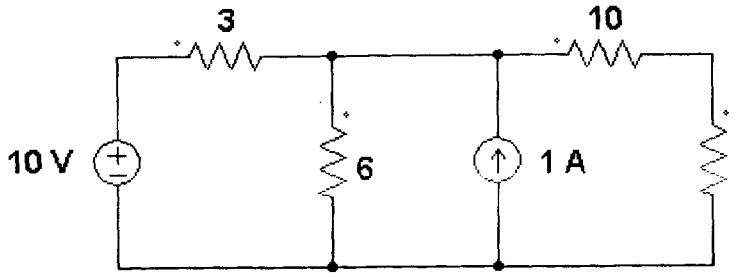
(d) Find the equivalent inductance of the three series connected coupled coils.



(e) Obtain dual for following N/W.

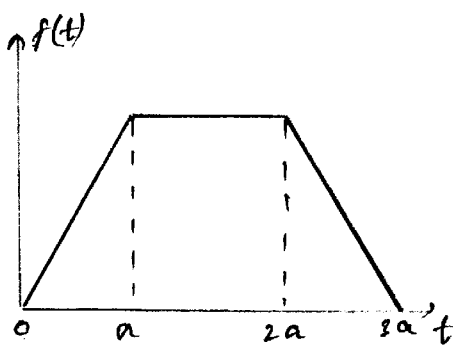


4 (a) Attempt all questions : **10**
(each question carries **equal** marks)
(i) For given network, find R_{int}

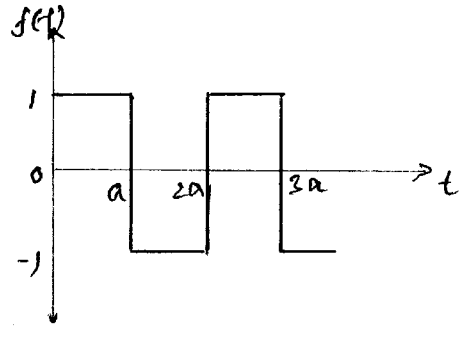


(ii) Define and explain initial value theorem.
(iii) Find the Laplace transformation of f(t) = $\mathbf{t^n}$.
(iv) Find the Laplace transformation of f(t) = $\mathbf{e^{-at}}$
(v) Explain Dependent and Independent energy sources.

(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

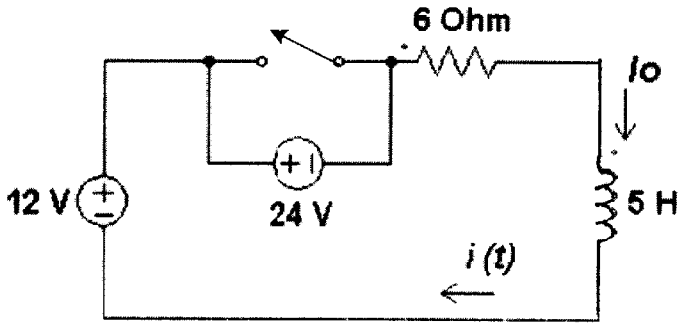
(i) $F(s)=\dfrac{s+5}{s\left(s^2+2s+5\right)}$

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

5 (a) For RLC circuit find : 7

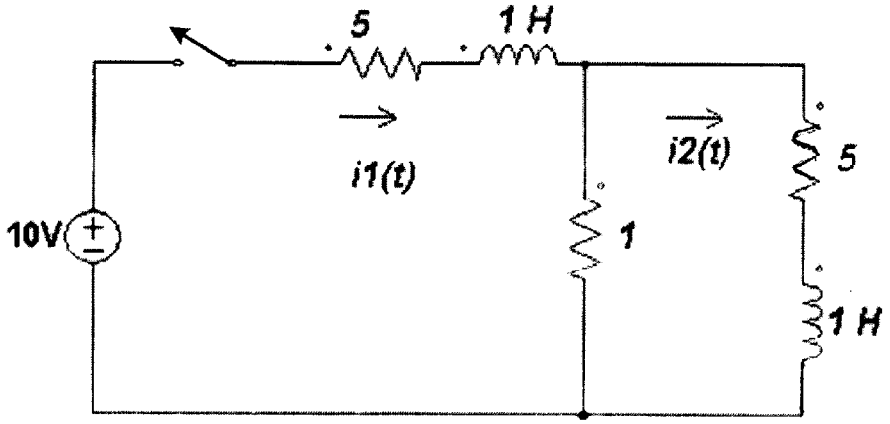
(i) Damping factor
(ii) Damping ratio
(iii) Actual frequency of oscillation
(iv) Bandwidth
(v) Q-factor
(vi) Half power frequency
(vii) Pole-zero location.

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



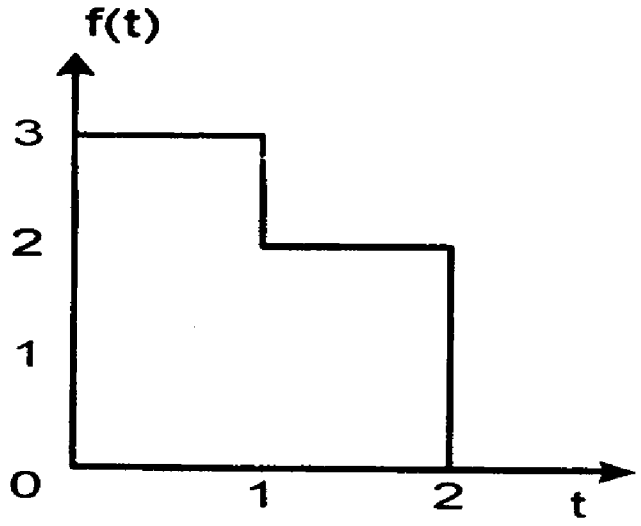
OR

(b) Using Laplace Transform, find $i_{2\,p}(t)$ 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.



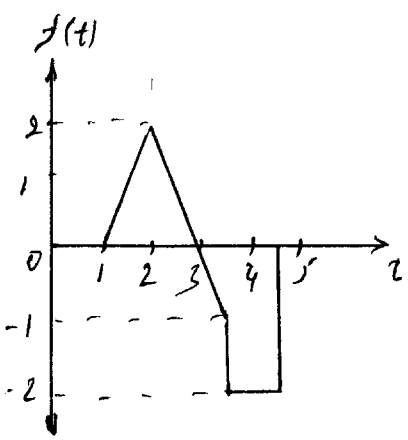
(b) Draw the waveform from wave equation

(ii) Define following and obtain its Laplace transform :

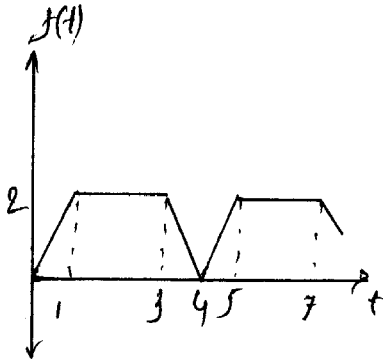
(a) Unit step function

(b) Unit impulse function.

(iii) Find the Laplace Transform of following waveform :

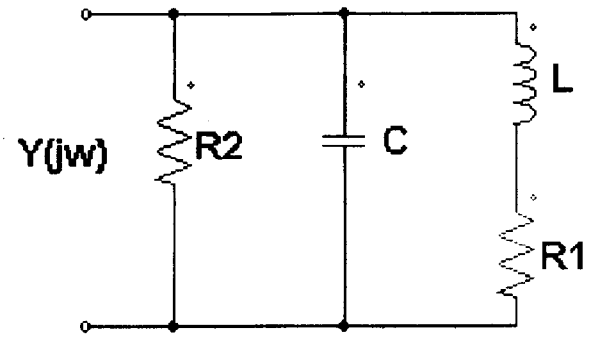


(a)



(b)

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



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