Ref No:

Ex/EE/5/T/112/2019

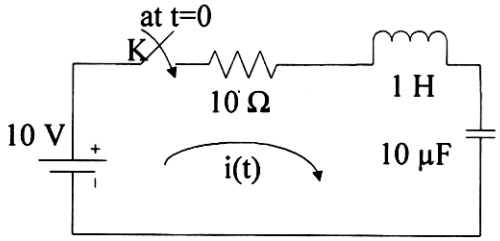
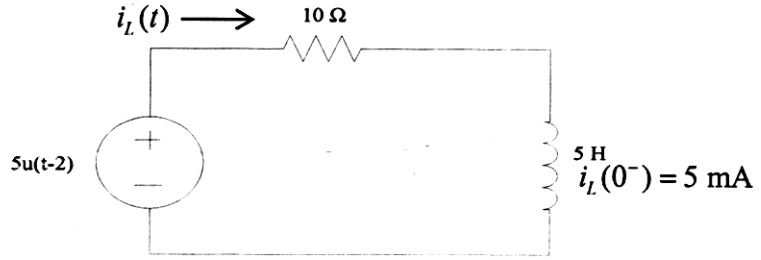
BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIRST YEAR FIRST SEMESTER – 2019

SUBJECT: - CIRCUIT THEORY

Time: Three hours

Full Marks: 100
(50 marks for this part)

Use a separate Answer-Script for each part

No. of Question		PART -I Answer any Three (Two marks reserved for well organized answers)	Marks
1)		Explain the following: (i) Static and Dynamic Systems. (ii) Linear and Non-Linear Systems. (iii) Passive and Causal Network.	(16)
2)	a)	Define a unit step function and unit ramp function. What is the relationship between the two singularity functions?	(8)
	b)	Write a short note on the concept of complex frequency.	(8)
3)	a)	"The capacitor can be represented as a short circuit at t = 0^+" – Explain.	(8)
	b)	For the circuit shown in Fig.Q.3 (b), if the switch is closed at t= 0, find the values of $i(0^+), \frac{di}{dt}(0^+)$ *and* $\frac{d^2i}{dt^2}(0^+)$	(8)
		 Fig.Q.3(b)	
4)	a)	For the circuit shown in Fig.Q.4.(a) find $i_L(t)$  Fig.Q.4.(a)	(10)

(Please turn over)

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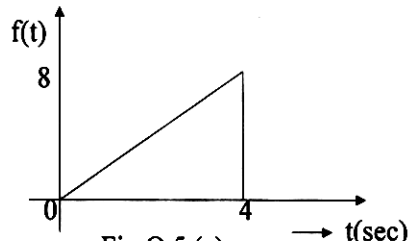
	b)	State and derive the initial value theorem.	(6)
5)	a)	Find the Laplace transform of the following signal.  Fig.Q.5.(a)	(8)
	b)	Find the Laplace transform of the following: (i) $e^{-at}\cos\omega_o t\ u(t)$ (ii) $tu(t)$ (iii) $\sin\omega_o t\ u(t)$ (iv) $t^3e^{-at}u(t)$	(2×4)

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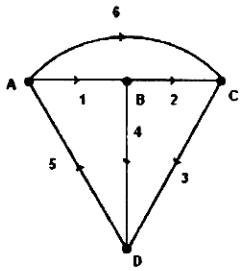
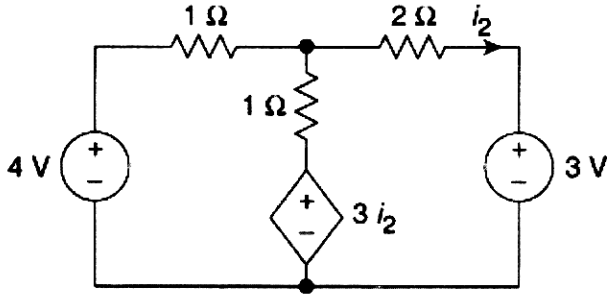
SUBJECT : CIRCUIT THEORY

Time : Three hours **Full Marks -100**
(50 marks for each part)

Use a separate Answer-Script for each part

No. of question	**Part II** **Answer any three questions.** **Two marks reserved for neatness and well organized answer.**	Marks
1.a)	Define tree, twig, link and co-tree of a graph of any electrical network with suitable examples.	8
b)	Find the no of possible trees of the given graph. Also write down the reduced incidence matrix, tie-set matrix & cut-set matrix of the graph shown below:  	8
2.a)	Derive equilibrium equations of a network on loop basis using the tie-set matrix of the network.	8
b)	Determine current in all the branches of the circuit using graph theory:  	8
3.a)	Explain with suitable example what is meant by (a) incidence matrix, (b) cut-set and (c) fundamental tie-set.	6
b)	State and explain Norton's Theorem.	2

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(50 marks for each part)

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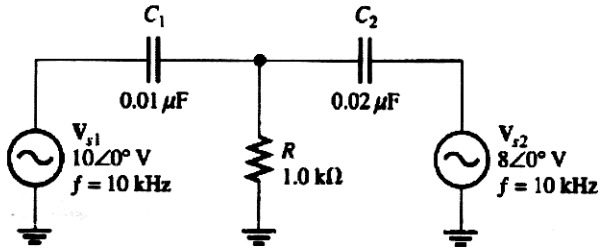
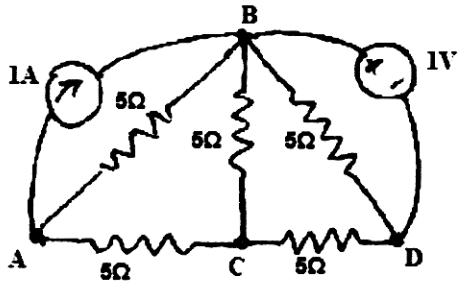
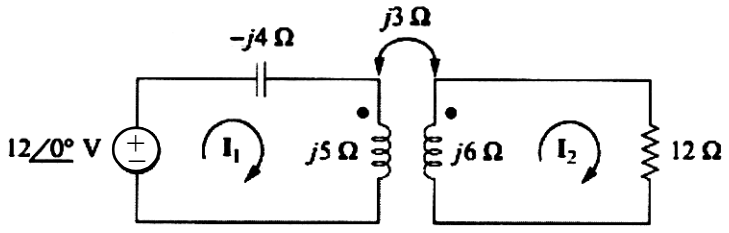
c)	Find the current through resistance R using Superposition theorem: 	8
4.a)	State Superposition Theorem.	2
b)	Write short note on Magnetically coupled circuit.	8
c)	Two coils with self inductance of 5 H and 8 H are mutually coupled, the coefficient of coupling being 0.5. The coils are connected in series and produce flux in the opposite directions in the common magnetic circuit. Find equivalent inductance of the combination.	6
5.a)	Draw the directed graph of the network. Write the tie-set matrix and hence obtain the equilibrium equation on loop basis. 	10
b)	Calculate the currents I_1 and I_2 in the following circuit: 	6