Q.5 i. Obtain the transform current I(s) in the circuit shown in Fig.11 below assuming initial conditions to be zero. **4**

ii. The switch K is at 1 for long time and is moved from 1 to 2 at t =0. Determine i_L for t > 0 in Fig.12. **6**

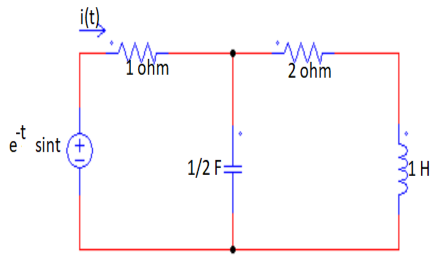

Fig. 11

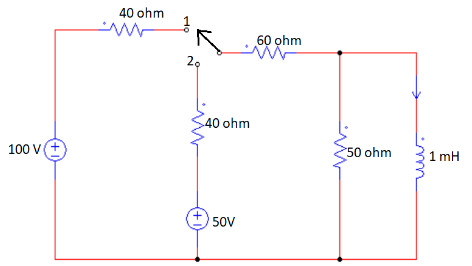

Fig. 12

OR iii. In the network shown in Fig.13 below the initial voltage on C_1 is 2 volt and on C_2 is 1 Volt. At t=0, the switch is closed. Determine i(t), v_1 (t) and v_2 (t) for t>0 using Laplace Transformation. **6**

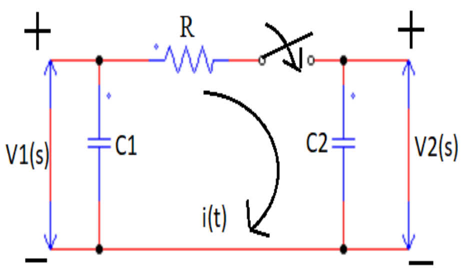

Fig.13

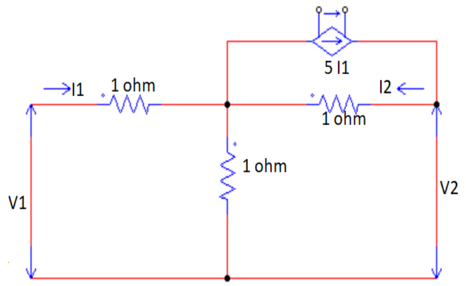

Fig.14

Q.6 Attempt any two:

i. Calculate h-parameters for the circuit shown above in Fig.14. **5**

ii. Find the first Cauer form of R-C network for impedance function **5**

$$Z(s) = \frac{(s^2 + 7s + 10)}{s^2 + 4s + 3}$$

iii. Find ABCD parameters in terms of Z and Y parameter? **5**

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No......................................

Faculty of Engineering

End Sem (Odd) Examination Dec-2018

EE3CO07/EX3CO07 Circuit Analysis and Synthesis

Programme: B.Tech. Branch/Specialisation: EE/EX

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. The total power in a series circuit is 10 watt there are five equal value resistors in the circuit. How much power does each resistor dissipate **1**

(a) 10W (b) 5W (c) 2W (d) 1W

ii. When the superposition theorem is applied to any circuit, the dependent voltage source in that circuit is always **1**

(a) Active (b) Opened (c) Shorted (d) None of these

iii. The tie-set schedule gives the relation between **1**

(a) Branch current and link currents
(b) Branch voltage and link voltage
(c) Branch current and link voltage
(d) None of the above

iv. The reciprocity theorem is applicable to **1**

(a) Linear network only (b) Bilateral networks only
(c) Linear bilateral networks (d) Neither of the two

v. For a two port network to be reciprocal **1**

(a) $Z_{11}=Z_{22}$ (b) $Y_{21}=Y_{22}$ (c) $h_{21}= -h_{12}$ (d) AD-BC=0

vi. For a two port bilateral network, the three transmission parameter are given by A=6/5; B=17/5; and C=1/5. What is the value of D? **1**

(a) 1 (b) 1/5 (c) 7/5 (d) 5

vii. The transient response occurs **1**

(a) Only in resistive circuits (b) Only in Inductive circuits
(c) Only in capacitive circuits (d) Both (b) & (c)

viii. The transient current in a loss-free LC circuit when excited from an ac source is an _______ sine wave **1**

(a) Undamped (b) Overdamped
(c) Underdamped (d) Critically damped

ix. In the first Foster form, the presence of last element inductor L_{∞} indicates. **1**
(a) Pole at ω=0 (b) Pole at ω=∞
(c) Zero at ω=0 (d) Zero at ω=∞

x. The final value theorem is used to find the **1**
(a) Steady state value of the system output
(b) Initial value of the system output
(c) Transient behaviour of the system output
(d) None of these

Q.2 i. Write the tie set matrix and determine the KVL equation and also calculate the loop currents for the network shown in Fig.1 below. **2**

ii. Draw the graph for the network shown in Fig.2 below and determine the number of possible trees. **3**

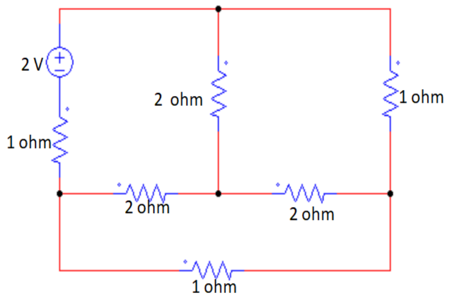


Fig.1

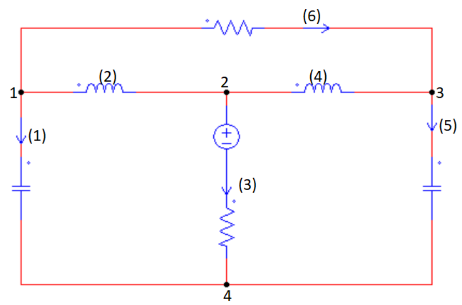


Fig.2

iii. Find the current passing through 6Ω resistors in Fig.3. **5**

OR iv. Find the power loss in 2Ω resistor by Maxwell loop method in Fig.4. **5**

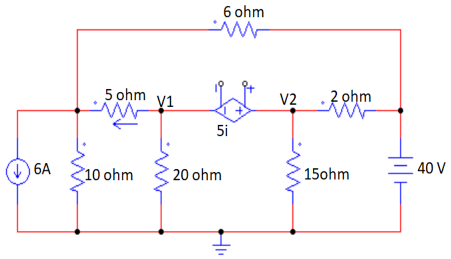


Fig.3

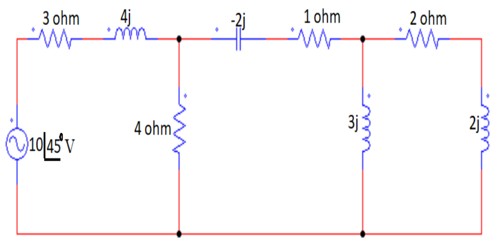


Fig.4

Q.3 i. State and prove Norton's theorem? **2**

ii. If we change the load 5+2j connected across terminals AB by 1+jΩ then find the change in current drawn from the supply by compensation theorem in Fig.5? **3**

iii. Find the thevenin's equivalent circuit and then find the power loss in 5ohm resistor for the circuit shown in Fig.6 below **5**

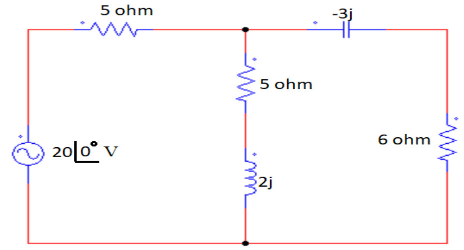


Fig. 5

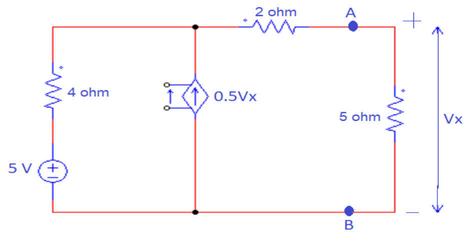


Fig. 6

OR iv Find the voltage drop across the capacitor by superposition theorem in Fig.7? **5**

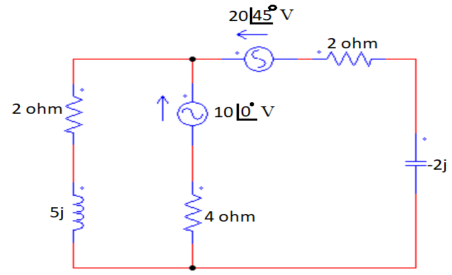


Fig.7

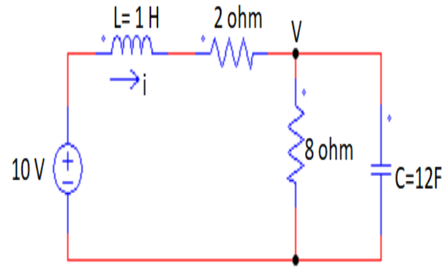


Fig.8

Q.4 i. In the circuit find i(∞) and v(∞) i.e., the steady state values of the network shown in Fig.8 above. **2**

ii. In the network Fig.9 below switch K is closed at t=0. Determine $i_c, i_L, \frac{dv_c}{dt}, \frac{dv_2}{dt}$ at t=0$^+$. **8**

OR iii. Find the expression for current i(t) for t > 0 if switch is closed at t=0 in Fig.10. **8**

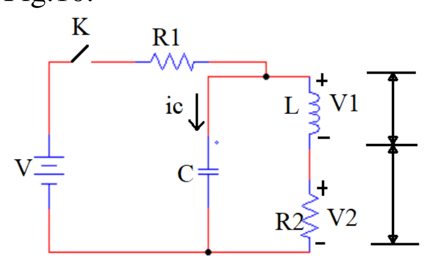


Fig.9

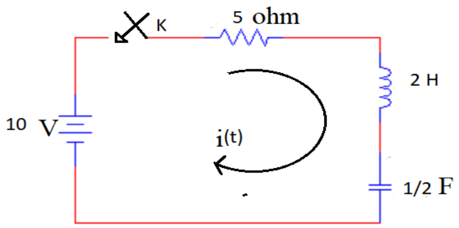


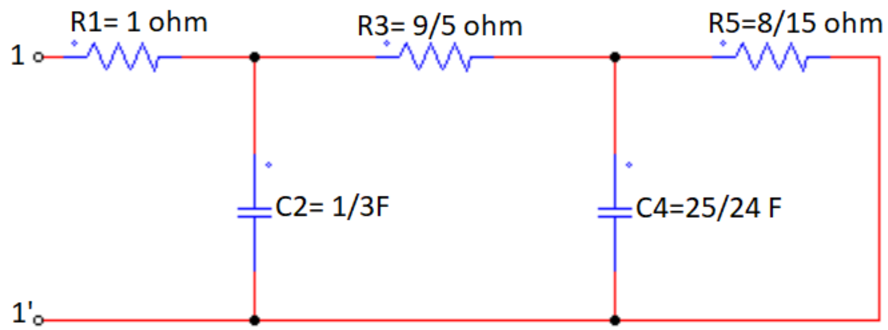
Fig.10

Marking Scheme

EE3CO07/EX3CO07 Circuit Analysis and Synthesis

Q.1	i.	The total power in a series circuit is 10 watt there are five equal value resistors in the circuit. How much power does each resistor dissipate (c) 2W		1
	ii.	When the superposition theorem is applied to any circuit, the dependent voltage source in that circuit is always (a) active		1
	iii.	The tie-set schedule gives the relation between (a) Branch current and link currents		1
	iv.	The reciprocity theorem is applicable to (c) Linear & bilateral networks		1
	v.	For a two port network to be reciprocal (c) h_{21}= -h_{12}		1
	vi.	For a two port bilateral network, the three transmission parameter are given by A=6/5; B=17/5; and C=1/5. What is the value of D? (c) 7/5		1
	vii.	The transient response occurs (d) Both (b) & (c)		1
	viii.	The transient current in a loss-free LC circuit when excited from an ac source is an--------- sine wave (a) Undamped		1
	ix.	In the first Foster form, the presence of Last element Inductor L_∞ indicates. (b) pole at ω=∞		1
	x.	The final value theorem is used to find the (a) Steady state value of the system output		1
Q.2	i.	Tie Set Matrix & KVL Equation	2 marks	3
		Loop Currents	1 mark	
	ii.	Draw the graph	1 mark	3
		Determine the number of possible trees.	2 marks	
	iii.	For Equations	3 marks	4
		Current Passing through 6 ohm resistor= 5 Amp	1 mark	
OR	iv.	For Equations	3 marks	4
		power lost in 2Ω resistor= 0.9934	1 mark	
Q.3	i.	Statement	1 mark	2
		Proof	1 mark	
	ii.	Change in Current, I = 1.444∠21.52º	1.5 marks	3
		Compensation Voltage, Vc= 2.043∠23047º	1.5 marks	
OR	iii.	Thevenins Equivalent	3 marks	5
		(Vth= 5V, Isc= 0.55 Amp, Rth= 9 Ω)		
		Power Loss in 5 ohm resistor= 637mW	2 marks	
OR	iv	Current Passing through the capacitor,		5
		I_C = 1.4092.674j Amp	2.5 marks	
		Voltage across capacitor,		
		Vc= 5.348+2.818j Volt	2.5 marks	
Q.4	i.	i(∞) = 1 Amp	1 mark	2
		v(∞) = 8 Volt	1 mark	
	ii.	Ic (0+)= V/R1	2 marks	8
		I_L (0+)= 0	2 marks	
		dv_c/dt (0+)=I_C/C	2 marks	
		dv^2/dt^2 (0+) = 0	2 marks	
OR	iii.	At t > 0 i(t) = $k1e^{-0.5t} + k2e^{-2t}$	4 marks	8
		At t= 0, i(t) = $3.33e^{-0.5t} - 3.33e^{-2t}$	4 marks	
Q.5	i.	$Z(s) = \frac{(s^2+4s+6)}{s^2+2s+2}$	2 marks	4
		$I(s) = \frac{1}{s^2+4s+6}$	2 marks	
	ii.	i(t) = $0.5 - 0.5e^{-\left(\frac{105}{3}\right)t} + e^{-\left(\frac{105}{3}\right)t}$	6 marks	6
OR	iii.	i(t) = $\frac{1}{R}e^{-\left(\frac{C1+C2}{C12R}\right)t}$	2 marks	6
		$v_1(t) = 2\frac{C}{C1}[1 - e^{-\frac{t}{RC}}]$	2 marks	
		$V_2(t) = 1\frac{C1}{C1+C2}e^{-\left(\frac{C1}{C1+C2}\right)t} + \frac{C1}{(C1+C2)}$	2 marks	
Q.6		Attempt any two:		
	i.	ABCD Parameters in terms of Z	2.5 marks	5
		ABCD Parameters in terms of Y	2.5 marks	

ii. **5**



iii.	$h_{11}=1\Omega$	1.25 marks	**5**
	$h_{12} = 1/2$	1.25 marks	
	$h_{21} = 3$	1.25 marks	
	$h_{22}=1/2$ mho	1.25 marks	

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