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ECE Dept.
Exam
Internal Assessment
Odd Sem(2018-19)

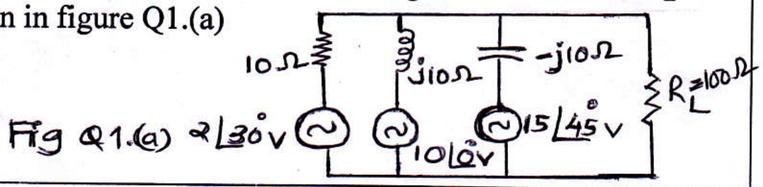
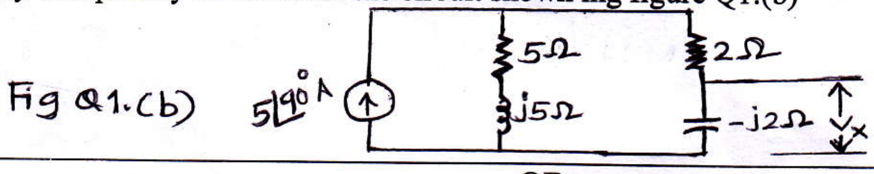
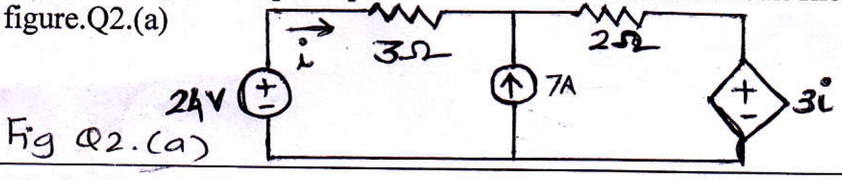
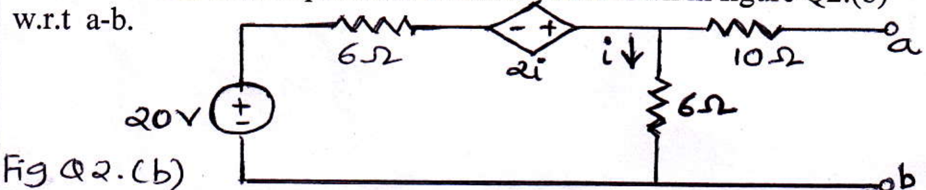
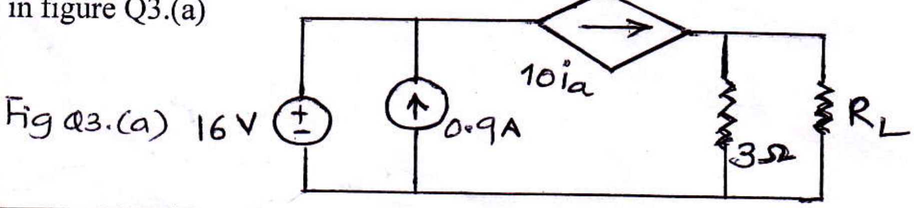
SECOND INTERNAL ASSESSMENT

Sem: III EC
Date: 17/10/2018

Subject: Network Analysis
Time: 11a.m-12 noon

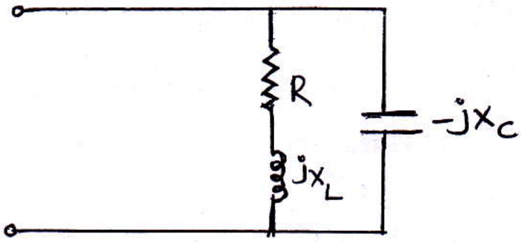
Sub. Code: 17EC35
Max. Marks: **30**

Note: Answer two full questions..

Q. No		Description of Questions	Marks	CO	RBT Level
1	a	Using Millimans theorem find the current through load resistance R_L for the circuit shown in figure Q1.(a) 	7	C205.2	L4
	b	State Reciprocity theorem. Verfiy Reciprocity theorem for the circuit shown ing figure Q1.(b) 	8	C205.2	L4
		OR			
2	*a*	Using Superposition principle find the current i for the circuit shown in figure.Q2.(a) 	8	C205.2	L4
	b	Obtain the Thevenin equivalent of the circuit shown in figure Q2.(b) w.r.t a-b. 	7	C205.2	L4
3	a	Find the value of R_L for maximum power transfer for the network shown in figure Q3.(a) 	8	C205.2	L4
	b	State Maximum power transfer theorem & also prove that Pmax = $Vth^2/4R_L$, where Vth is Thevenins voltage.	7	C205.2	L4

OR

Please Turn Overleaf

4	a	Define Resonance. Obtain the expression for the resonant frequency for the circuit shown in figure Q4.(a) 	8	C205.4	L4
	b	A series RLC circuit has R=4Ω, L= 1mH, C=10μF.Calculate resonant frequency,Q factor,half power frequencies & B.W.	7	C205.4	L4

Course Coordinator
Prof. S.S.Malaj

Module Coordinator
Prof.M.M.Gadag

HOD
Dr.V.G.Kasabegoudar

IA - 2 SCHEME OF EVALUATION

Sem : III rd	Subject : Network Analysis	Sub Code : 17EC35	Date : 17/10/2018		
Q. No.	**Bit**	**Description**	**Marks**	**CO's**	**RBT LEVEL**
1	a)	(see below)	7	C205.2	L4
	b)	(see below)	4+4	C205.2	L4
2	a)	(see below)	4+4	C205.2	L4

1 a)

$$E = \frac{E_1Y_1 + E_2Y_2 + E_3Y_3}{Y_1+Y_2+Y_3} = \frac{2\angle 30 \times \frac{1}{10} + 10\angle 0^\circ \times \frac{1}{j10} + 15\angle 45^\circ \times \frac{1}{-j10}}{\frac{1}{10} + \frac{1}{j10} + \frac{1}{-j10}}$$

$$E = 9.01\angle 169.77^\circ \qquad Z = \frac{1}{0.1 + 0.1j - 0.1j} = 10$$

$$I_L = \frac{9.01\angle 169.77}{10 + 100\angle 0}$$

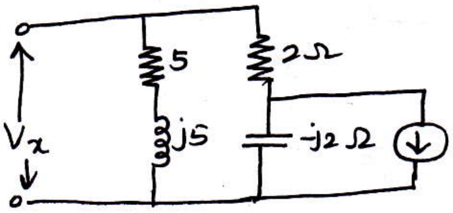
$$I_L = \frac{9.01\angle 169.77}{110} = 0.082\angle 169.77 \text{ A}$$

b) Using current division principle

$$I_2 = 5\angle 90^\circ \times \frac{5+j5}{7+j3} = 9.29\angle 27.8^\circ \text{ A}$$

$$V_x = I_2(-j2) = 9.284\angle 21.8^\circ \text{ V}$$

Interchange the positions of $5\angle 90^\circ$ A & V_x in the circuit as

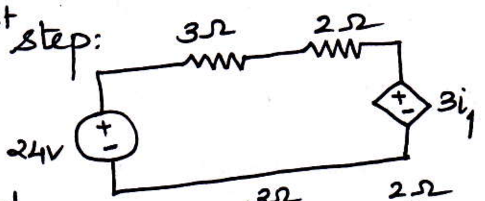


$$I_1 = 5\angle 90^\circ \times \frac{-j2}{7+j3} = -1.72 + 4.31j$$

$$V_x = (5+j5)\, I_1$$

$$V_x = 9.284\angle 21.8^\circ \text{ V}$$

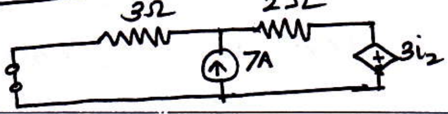
2 a) I^{st} step:



$$5i_1 + 3i_1 - 24 = 0$$

$$i_1 = \frac{24}{8} = 3\text{A}$$

II^{nd} step



KCL at node 1

$$i_2 + 7 = \frac{V_1 - 3i_2}{2}$$

$$V_1 = -3i_2 \quad i_2 = \frac{-7}{4} \text{A}$$

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IA - SCHEME OF EVALUATION

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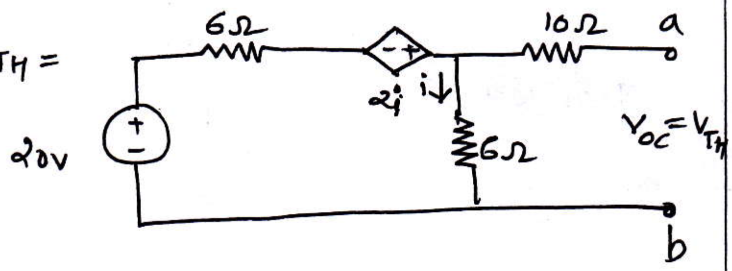
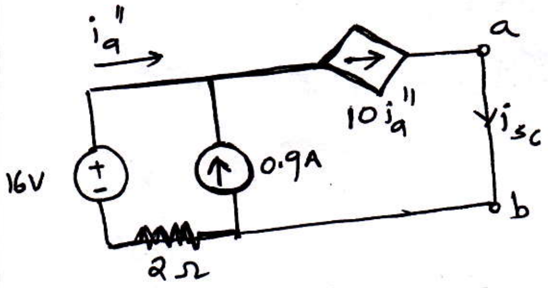
Q. No.	**Bit**	**Description**	**Marks**	**CO's**	**RBT LEVEL**
		$\therefore\ i = i_1 + i_2 = 3 - \frac{7}{4} = \frac{5}{4} A = \frac{5}{4} A$			
2	b)	$V_{oc} = V_{TH} =$  $V_{oc} = V_{TH} = 6i = 6 \times 2 = 12V$ To find R_{TH} $R_{TH} = \frac{V_{oc}}{i_{sc}} = \frac{12}{\frac{120}{136}} = 13.6\,\Omega$	4+3	C205.2	L4
3	a)	 $V_{oc} = 3(10 i_a'')$ $= 3 \times 10 \times 0.1$ $= 3V$ $i_{sc} = 1A$ To find $R_{TH} = \frac{V_{oc}}{i_{sc}} = \frac{3}{1} = 3\,\Omega$	4+4	C205.2	L4
	b)	Max power transfer theorem states that the max power delivered by a source represented by its Thevenin's eqvt ckt is attained when load R_L is equal	4+3	C205.2	L4

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Q. No.	**Bit**	**Description**		**Marks**	**CO's**	**RBT LEVEL**
		to R_t. $P = i^2 R_L = \left[\frac{V_t}{R_t+R_L}\right]^2 R_L$ $\frac{dP}{dR_L} = V_t^2 \left[\frac{(R_t+R_L)^2 - 2R_L(R_t+R_L)}{(R_t+R_L)^4}\right] = 0$ $R_L = R_t$ $\therefore P_{max} = \frac{V_t^2 R_L}{(2R_L)^2} = \frac{V_t^2}{4R_L}$				
4	a)	Resonance:— A.C ckts made up of resistors, inductors & Capacitors are said to be resonant circuits when the current drawn from the supply is in phase with the impressed sinusoidal voltage. $Y = Y_L + Y_C = \frac{R - j\omega L}{R^2+\omega^2L^2} + j\omega C$ $= \frac{R}{R^2+\omega^2L^2} + j\left(\omega C - \frac{\omega L}{R^2+\omega^2L^2}\right)$ At resonance, imaginary part is zero. $\omega_r C - \frac{\omega_r L}{R^2+\omega_r^2L^2} = 0$ or $\omega_r C = \frac{\omega_r L}{R^2+\omega_r^2L^2}$		3+5	C205.4	L4

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Q. No.	**Bit**	**Description**	**Marks**	**CO's**	**RBT LEVEL**
		$\omega_r = \sqrt{\frac{1}{LC} - \frac{R^2}{L^2}}$ $f_r = \frac{1}{2\pi}\sqrt{\frac{1}{LC} - \frac{R^2}{L^2}}$			
4	b)	$f_r = \frac{1}{2\pi\sqrt{LC}} = 1.591 \times 10^3\ Hz$ $Q = \frac{\omega_0}{B.W}$ $\quad Q = \frac{\omega_0 L}{R} = 2.499$ $B.W = f_2 - f_1 \quad f_1, f_2 = 318 Hz$ $f_1 = \frac{1}{2\pi}\left[\frac{-R}{2L} + \sqrt{\left(\frac{R}{2L}\right)^2 + \frac{1}{LC}}\right]$ $f_2 = \frac{1}{2\pi}\left[\frac{R}{2L} + \sqrt{\left(\frac{R}{2L}\right)^2 + \frac{1}{LC}}\right]$ [illegible] $B.W = \frac{f_r}{Q} = \frac{2 \times \pi \times f_r}{Q}$ $= \frac{2 \times \pi \times 1.591 \times 10^3}{2.499}$ $B.W = 318\ Hz$	2+1 +2+2	CO205.4	L4

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