CBCS SCHEME

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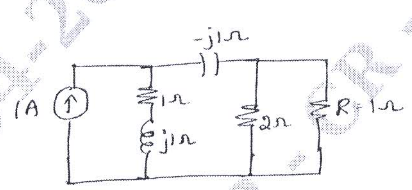
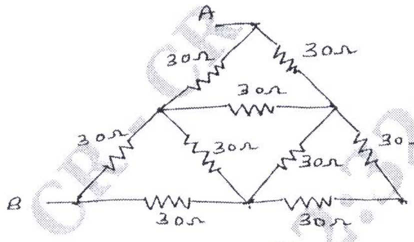
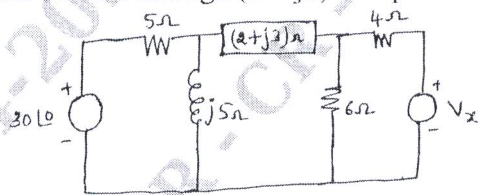
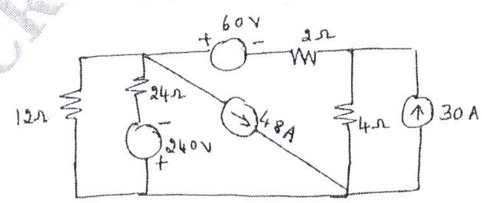
BEC304

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Network Analysis

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the classification of electrical networks.	8	L2	CO1
	b.	For the network shown in Fig. Q1(b), find the current through load resistor 'R' using loop analysis.  Fig. Q1(b)	6	L3	CO1
	c.	For the network shown in Fig. Q1(c), find the equivalent resistance between the terminals A – B using Star – Delta transformation.  Fig. Q1(c)	6	L3	CO1
		OR			
Q.2	a.	Derive an expression for the equivalent impedances between the terminals for Delta – Star transformation.	6	L2	CO1
	b.	Use modal analysis to find the value of voltage 'V_x' in the circuit shown in Fig. Q2(b), such that the current through $(2 + j3)\Omega$ impedance is zero.  Fig. Q2(b)	7	L3	CO1
	c.	Determine the current through 12Ω resistor shown in Fig. Q2(c), using Source Shifting / Transformation method.  Fig. Q2(c)	7	L3	CO1

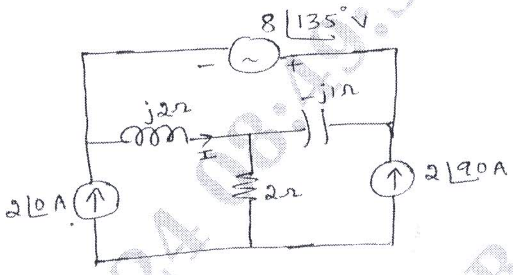
<table>
<tr><td colspan="6">Module – 2</td></tr>
<tr><td>Q.3</td><td>a.</td><td>Using Superposition theorem, obtain the current 'I' for the network shown in Fig. Q3(a).


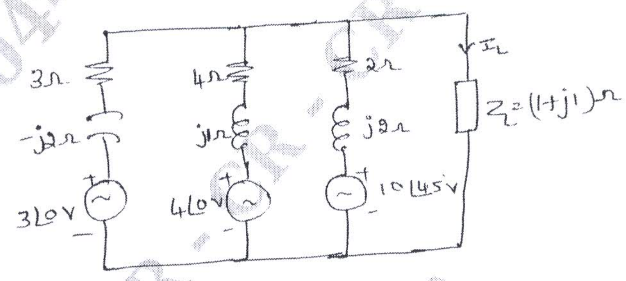
Fig. Q3(a)</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Using Millman's theorem, calculate the current through the load in the circuit shown in Fig. Q3(b).


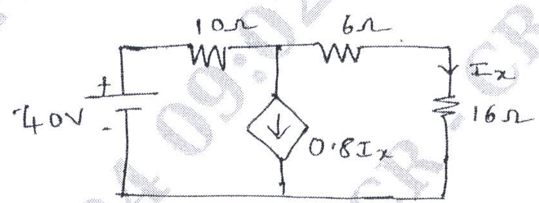
Fig. Q3(b)</td><td>10</td><td>L3</td><td>CO2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.4</td><td>a.</td><td>State and explain Norton's theorem.</td><td>6</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>For the network shown in Fig. Q4(b), find the current through 16Ω resistor using Thevenin's theorem.


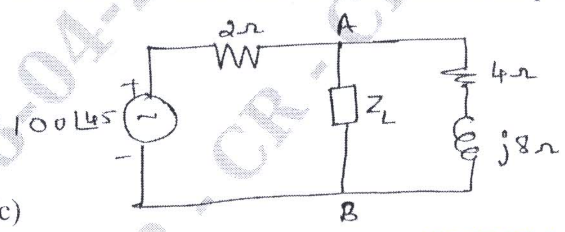
Fig. Q4(b)</td><td>7</td><td>L3</td><td>CO2</td></tr>
<tr><td></td><td>c.</td><td>For the network shown in Fig. Q4(c), find the value of Z_L for which maximum power transfer occurs. Also find the maximum power.


Fig. Q4(c)</td><td>7</td><td>L3</td><td>CO2</td></tr>
<tr><td colspan="6">Module – 3</td></tr>
<tr><td>Q.5</td><td>a.</td><td>Explain the initial and final conditions in basic elements.</td><td>6</td><td>L2</td><td>CO3</td></tr>
</table>

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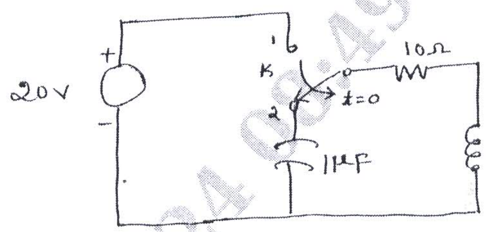
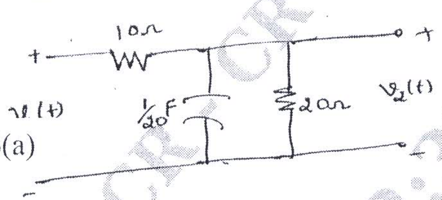
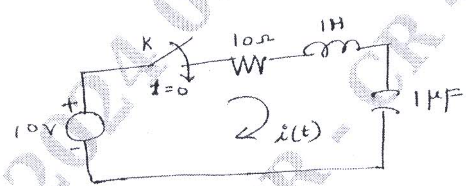
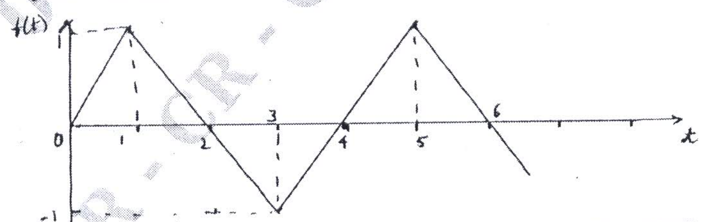
	b.	For the circuit shown in Fig. Q5(b), the switch 'K' is changing the position from 1 to 2 at t = 0. Steady state condition has been reached at position 1. Find the value of $i, \frac{di}{dt}, \frac{d^2i}{dt^2}$ at $t = 0^+$.  Fig. Q5(b)	8	L3	CO3
	c.	Obtain an expression for transient response i(t) of a series R – L circuit when excited by DC supply.	6	L2	CO3
		OR			
Q.6	a.	In the circuit shown in Fig. Q6(a), $v_1(t) = e^{-t}$ for $t \geq 0$ and zero for all $t < 0$. If the capacitor is initially uncharged, determine the value of $v_2(t)$, $\frac{dv_2(t)}{dt}$, $\frac{d^2v_2(t)}{dt^2}$ and $\frac{d^3v_2(t)}{dt^3}$ at $t = 0^+$.  Fig. Q6(a)	10	L3	CO3
	b.	For the circuit shown in Fig. Q6(b), the switch is closed at t = 0. Determine $i, \frac{di}{dt}, \frac{d^2i}{dt^2}$ and $\frac{d^3i}{dt^3}$ at $t = 0^+$.  Fig. Q6(b)	10	L3	CO3
		Module – 4			
Q.7	a.	State and prove Initial Value Theorem.	6	L2	CO3
	b.	Find the Laplace Transform of the periodic waveform shown in Fig. Q7(b).  Fig. Q7(b)	8	L3	CO3

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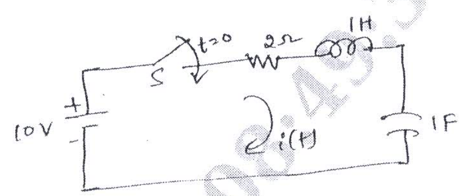
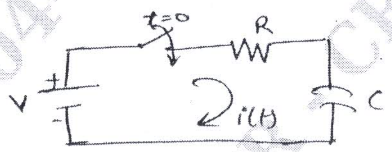
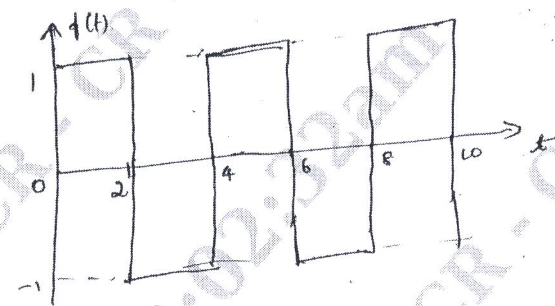
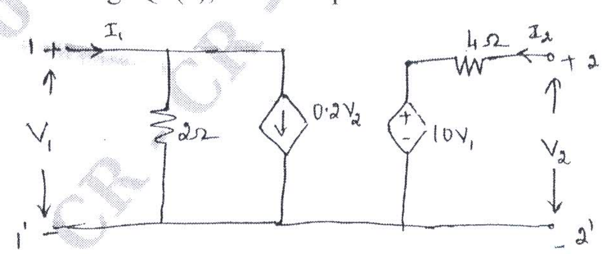
	c.	Using Laplace transform, determine the current i(t) in the circuit shown in Fig. Q7(c), when the switch 'S' is closed at t = 0. Assume zero initial conditions. Fig. Q7(c) 	6	L3	CO3
		OR			
Q.8	a.	State and prove differentiate by 'S' domain property.	6	L2	CO3
	b.	In the circuit shown in Fig. Q8(b), the switch is closed at t = 0. Obtain the expression for the current. Fig. Q8(b) 	6	L3	CO3
	c.	Obtain the Laplace Transform of the square wave shown in Fig. Q8(c). Fig. Q8(c) 	8	L3	CO3
		Module – 5			
Q.9	a.	What are Impedance and Hybrid parameters? Derive the expression for the same.	8	L2	CO4
	b.	Derive an expression for Transmission parameters interms of Z – parameters.	5	L2	CO4
	c.	For the circuit shown in Fig. Q9(c), find Y – parameters. Fig. Q9(c) 	7	L3	CO4
		OR			
Q.10	a.	Derive an expression for bandwidth of a series Resonant circuit.	7	L2	CO5

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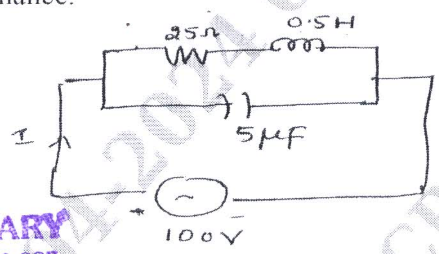
	b.	A series RLC circuit consists of a resistance of 1 kΩ and an inductance of 100mH in series with capacitance of 10PF connected across 100V supply. Determine i) Resonant frequency ii) Quality factor iii) Maximum current in the circuit iv) Bandwidth v) Half power frequencies v) Selectivity factor.	7	L3	CO5
	c.	For the circuit shown in Fig. Q10(c), find i) Resonant frequency ii) Quality factor iii) Bandwidth iv) Impedance at resonance v) Current at resonance.  Fig. Q10(c)	6	L3	CO5

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