CBCS SCHEME

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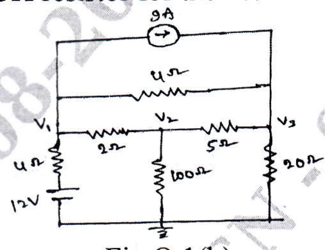
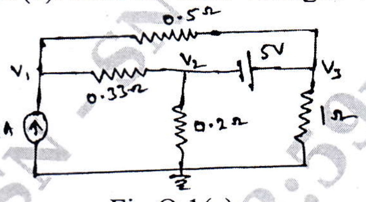
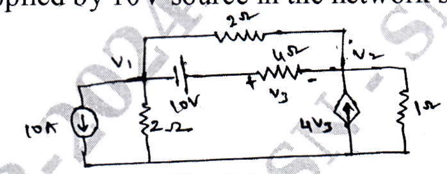
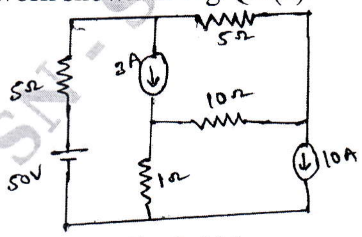
BEE302

Third Semester B.E./B.Tech. Degree Examination, June/July 2024

Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	**M**	**L**	**C**
Q.1	**a.**	Explain active and passive elements with example.	4	L2	CO1
	b.	Find the voltage across 5Ω resistor for the network shown in Fig.Q.1(b).  Fig.Q.1(b)	8	L3	CO1
	c.	In the network of Fig.Q.1(c). Find the node voltages V_1, V_2 and V_3.  Fig.Q.1(c)	8	L3	CO1
		OR			
Q.2	**a.**	Derive the relationship between Δ - Y transformation.	5	L2	CO1
	b.	Find the power supplied by 10V source in the network shown in Fig.Q.2(b).  Fig.Q.2(b)	7	L3	CO1
	c.	Determine the power delivered by the voltage source and the current in the 10Ω resistor of the network shown in Fig.Q.2(c).  Fig.Q.2(c)	8	L3	CO1

Module – 2

Q.3 a. Find the current I in the network shown in Fig.Q.3(a) using superposition theorem.

Marks: 10 | L3 | CO2

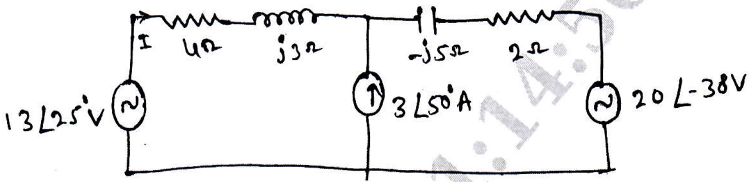


Fig.Q.3(a)

b. Find Thevenin's Equivalent network for Fig.Q.3(b)

Marks: 10 | L3 | CO2

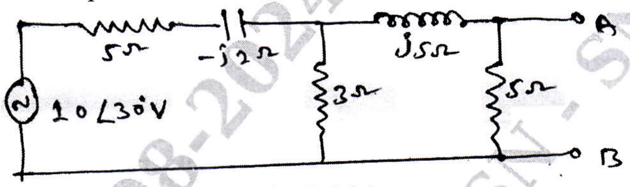


Fig.Q.3(b)

OR

Q.4 a. Find the current through the 10Ω resistor for the Fig.Q.4(a) using Norton's theorem.

Marks: 10 | L3 | CO2

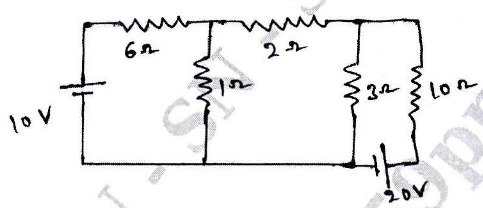


Fig.Q.4(a)

b. State and prove maximum power transfer theorem.

Marks: 10 | L2 | CO2

Module – 3

Q.5 a. A series RLC circuit has R = 10Ω and L = 60mH. At a frequency of 25Hz the power factor of the circuit is 45° lead. At what frequency will the circuit be resonant.

Marks: 5 | L3 | CO3

b. What are initial conditions? show the behavior of R, L and C elements at the time of switching at $t = 0$ both at $t = 0^+$ and $t = \infty$.

Marks: 8 | L2 | CO3

c. For a network shown in Fig.Q.5(c) switch is changed from the position 1 to the position 2 at $t = 0$. Steady state condition reached before switching. Find the values i, $\frac{\partial i}{dt}$ and $\frac{\partial^2 i}{dt^2}$ at $t = 0^+$.

Marks: 7 | L4 | CO3

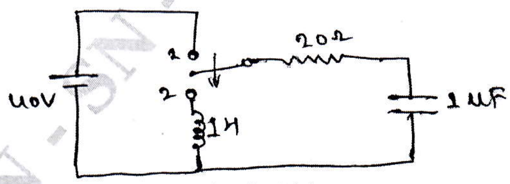
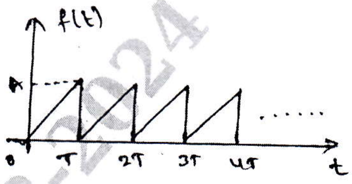
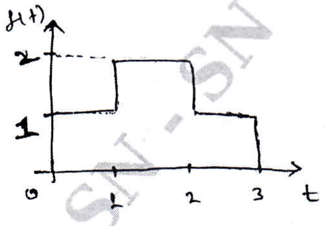
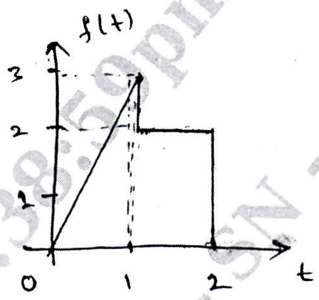
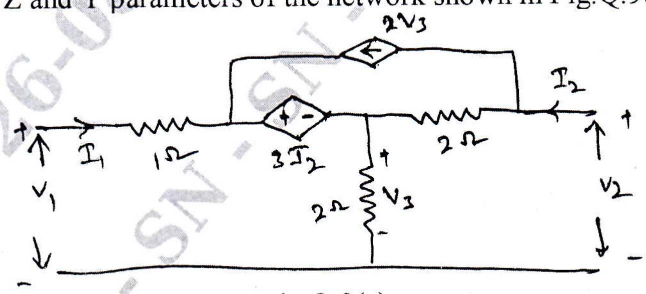
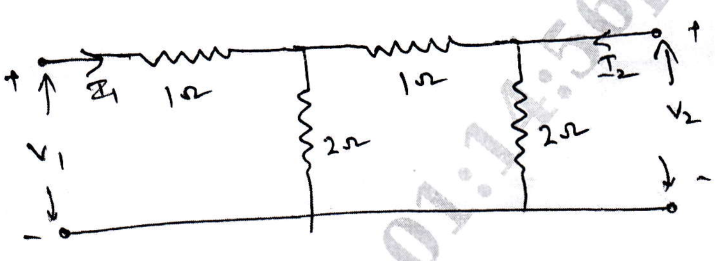
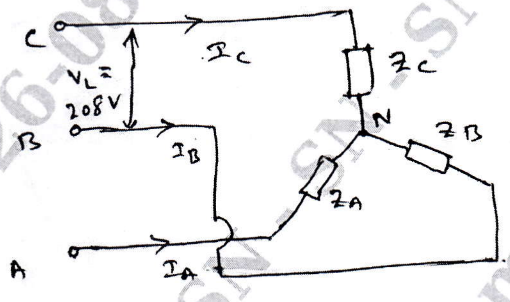


Fig.Q.5(c)

		OR			
Q.6	**a.**	Derive an expression for R – C circuit under DC excitation find voltage across R and C also.	**10**	**L2**	**CO3**
	b.	A series resonant circuit has an impedance of 500Ω at resonant frequency. Cut off frequencies are 10kHz and 100Hz. Determine: i) Resonant frequency ii) Value of L and C iii) Quality factor at resonant frequency.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Find the Laplace transform of the waveform shown in Fig.Q.7(a).  Fig.Q.7(a)	**8**	**L4**	**CO4**
	b.	Verify the initial and final value theorems for $f(t) = e^{-t}(t+1)^2$.	**4**	**L3**	**CO4**
	c.	State and prove initial value theorem.	**8**	**L2**	**CO4**
		OR			
Q.8	**a.**	Find the Laplace transform of the waveform given below in Fig.Q.8(a) and (b) respectively.  Fig.Q.8(a)  Fig.Q.8(b)	**10**	**L4**	**CO4**
	b.	Find the Laplace transform of a unit step. Unit impulse and unit ramp functions.	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Determine Z and Y parameters of the network shown in Fig.Q.9(a).  Fig.Q.9(a).	**10**	**L4**	**CO5**
	b.	Express the Y-Parameters in terms of Z-Parameters.	**10**	**L3**	**CO5**

OR

Q.10	a.	Obtain the ABCD parameters for the network shown in the Fig.Q.10(a).  Fig.Q.10(a)	10	L4	CO5
	b.	A 3-phase, 4-wire, 208V, CBA system as shown in Fig.Q.10(b) has star connected load with $Z_A = 5\angle 0°\ \Omega$, $Z_B = 5\ \angle 30°\ \Omega$, $Z_C = 10\ \angle -60°\ \Omega$. Obtain the phase current, line currents and current through neutral wire.  Fig.Q.10(b)	10	L4	CO5

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