CBCS SCHEME

BEC304

USN 1CR24EC185

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

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.	Make use of source transformation technique, to find the voltage V_2 at node 2 in the circuit shown in Fig.Q1(a).	5	L3	CO1
	b.	Using Mesh analysis, find the power absorbed by 2 Ω resistor in the circuit shown in Fig.Q1(b).	8	L3	CO1
	c.	Apply node analysis to find V_A for the network shown in Fig.Q1(c).	7	L3	CO1

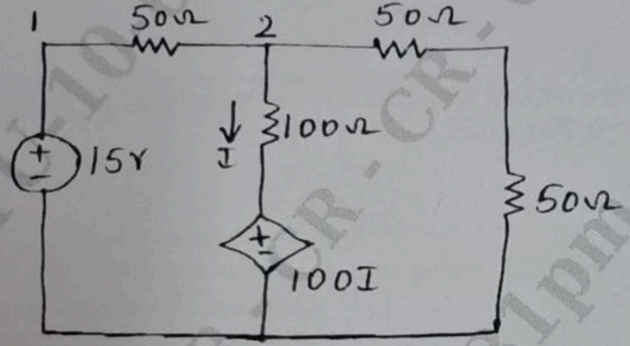


Fig.Q1(a)

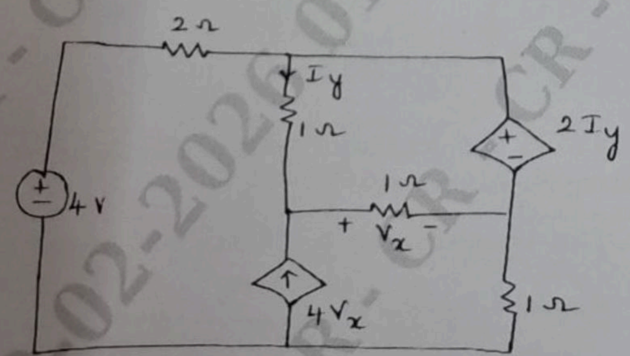


Fig.Q1(b)

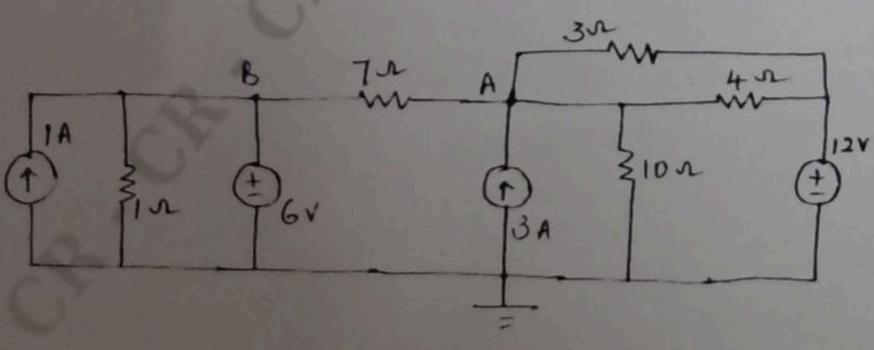


Fig.Q1(c)

OR

Q.2	a.	Find the equivalent resistance, between A and B using star – delta transformation for the circuit shown in Fig.Q2(a).			

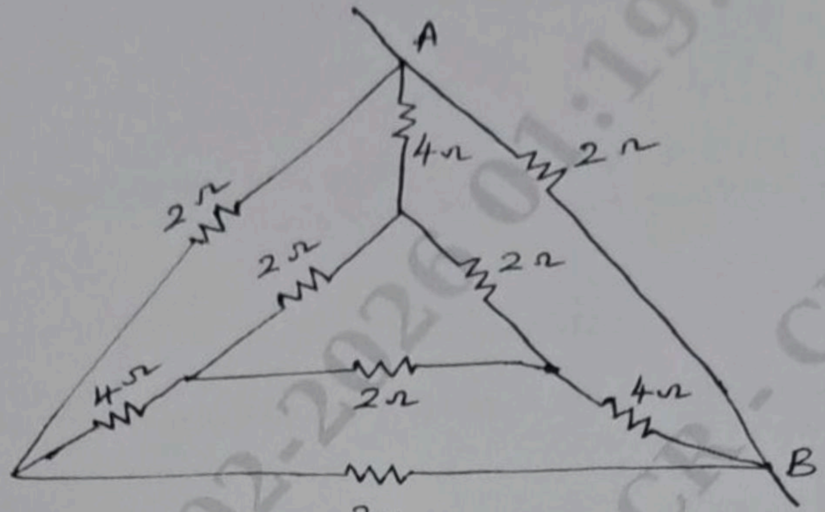


Fig.Q2(a)

	b.	Reduce the network shown in Fig.Q2(b), to find the current 'I' using source shifting and source transformation.	7	L3	

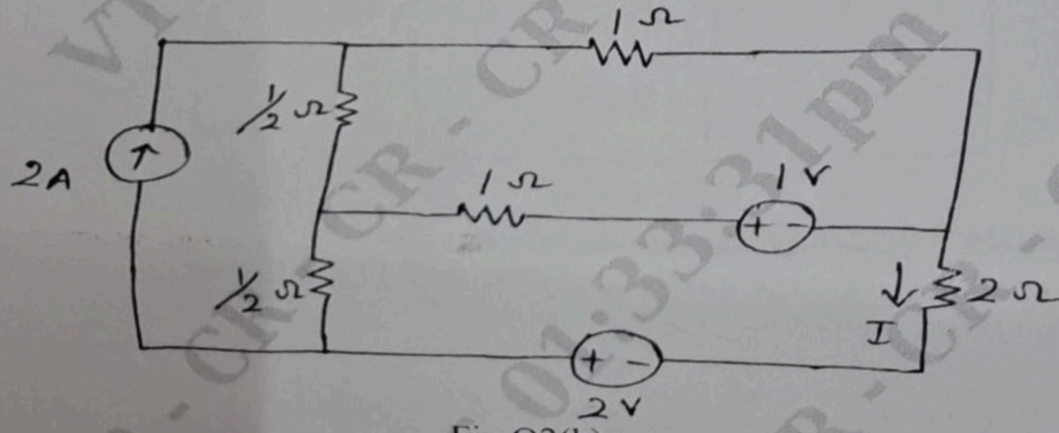


Fig.Q2(b)

	c.	Find the power delivered by the dependent voltage source in the network shown in Fig.Q2(c) using Node analysis.	6	L3	C

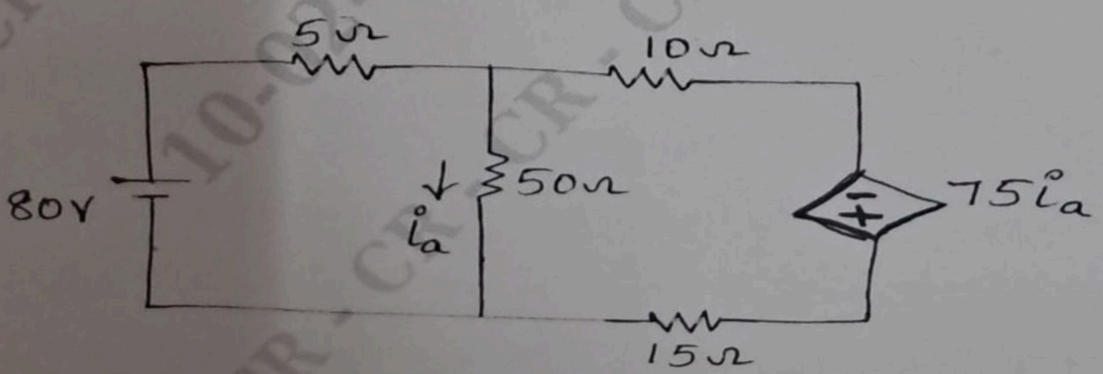


Fig.Q2(c)

e superposition theorem, to find the current 'i' for the circuit shown in Fig.Q3(a). — 6 | L3 | CO2

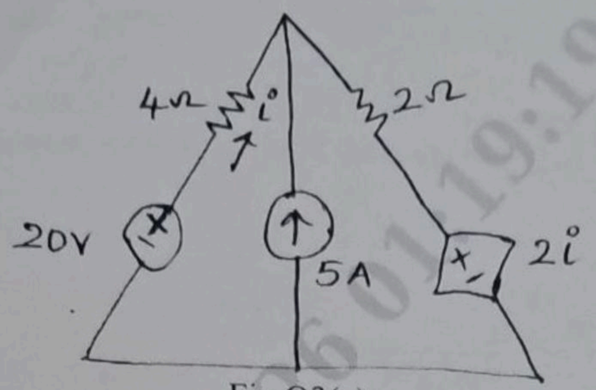


Fig.Q3(a)

b. Use Millman's theorem, to find current flowing through $(2 + j3)\Omega$ impedance, for the circuit given in Fig.Q3(b). — 6 | L3 | CO2

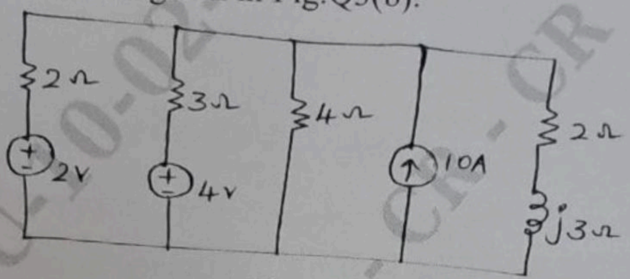


Fig.Q3(b)

c. State and find the condition for maximum power transfer in a AC circuit when load impedance is the invariable (Z_L). — 8 | L2 | CO2

OR

Q.4 a. Use Thevenin's theorem, to find the current through 'R_L' for the network shown in Fig.Q4(a). — 7 | L3 | CO2

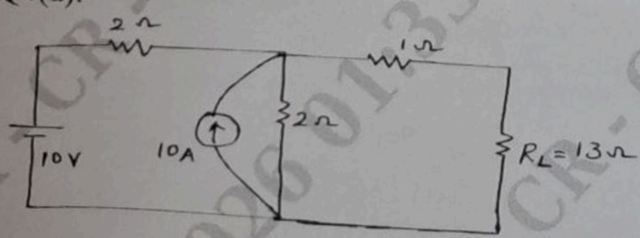


Fig.Q4(a)

b. Apply Norton's theorem to find the current through 16Ω resistor for the circuit shown in Fig.Q4(b). — 7 | L3 | CO2

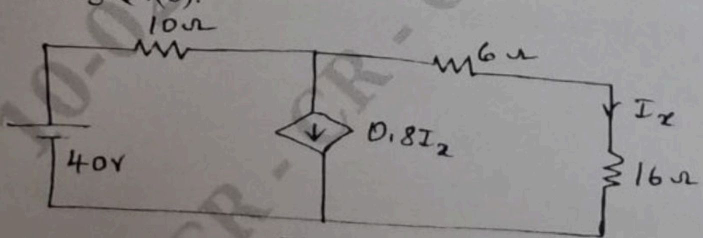


Fig.Q4(b)

c. Using Millman's theorem, find I_L through R_L for the network shown in Fig.Q4(c). — 6 | L3 | CO2

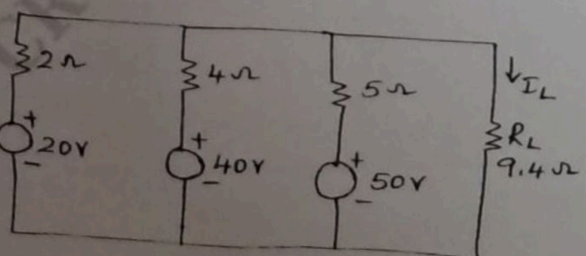
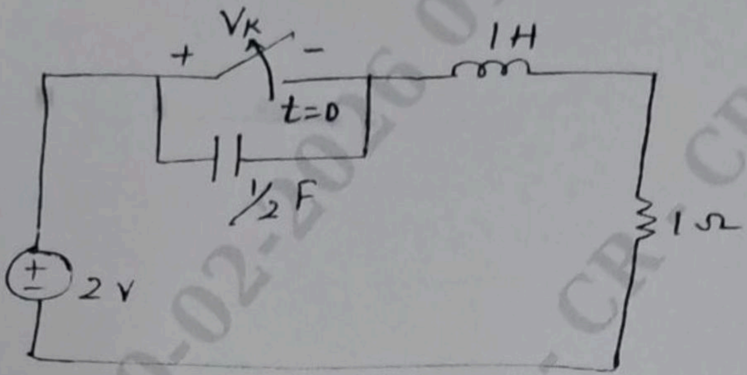
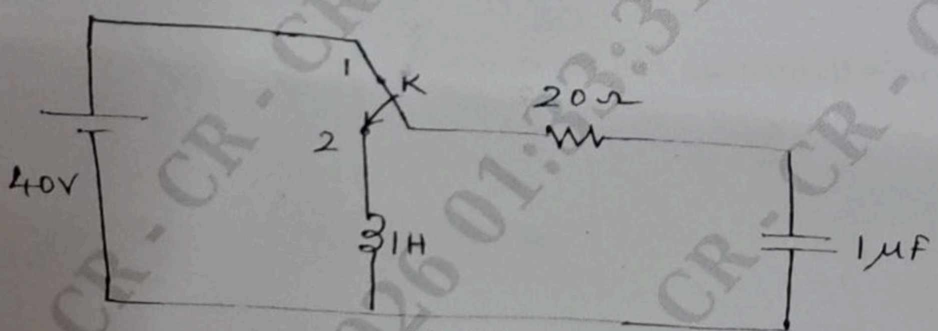
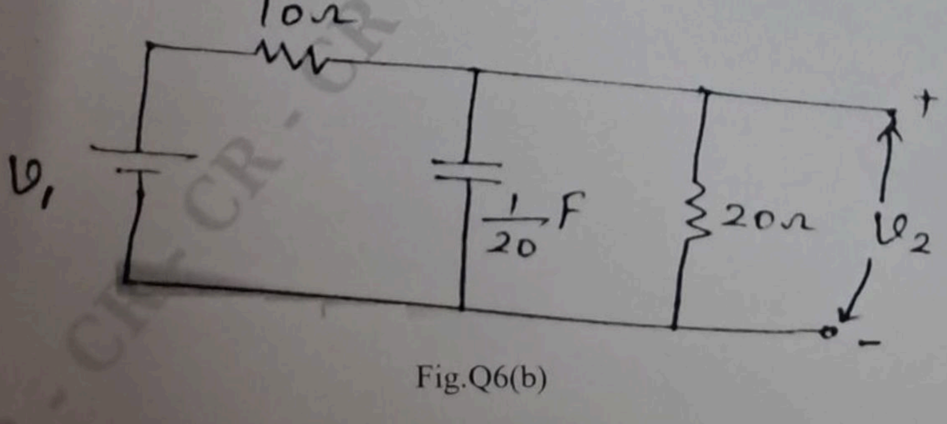


Fig.Q4(c)

Module – 3

Q.5	a.	Explain the transient behavior of the Resistance, Inductance and Capacitor.	10		
	b.	The circuit is in steady state with switch K closed for the circuit shown in Fig.Q5(b). At t = 0, the switch is opened. Find the voltage across the switch V_K, $\frac{dV_K}{dt}$ at t = 0+.  Fig.Q5(b)	10		

OR

Q.6	a.	In the circuit shown in Fig.Q6(a), the switch K is changed from Position-1 to Position-2 at t = 0, steady state having been reached before switching. Evaluate i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0+.  Fig.Q6(a)	10	L3	CO
	b.	In the circuit shown in Fig.Q6(b), $V_1(t) = e^{-t}$ for t ≥ 0 and is zero for all t < 0. If the capacitor is initially uncharged, determine the value of $\frac{dV_2}{dt}, \frac{d^2V_2}{dt^2}, \frac{d^3V_2}{dt^3}$ at t = 0+.  Fig.Q6(b)	10	L3	CO3

Module – 4

Find the Laplace transform of the following functions : (6 Marks, L3, CO3)

i) $t.e^{-at}$

ii) $\cos^3 3t$

iii) $\frac{1}{2a^2} \sin h\, a\, t \sin a\, t$.

b. Find the Laplace transform of the following functions : (6 Marks, L3, CO3)

i. Unit step function

ii. Ramp function.

c. Obtain the Laplace transform of the f(t) shown in Fig.Q7(c). (8 Marks, L3, CO3)

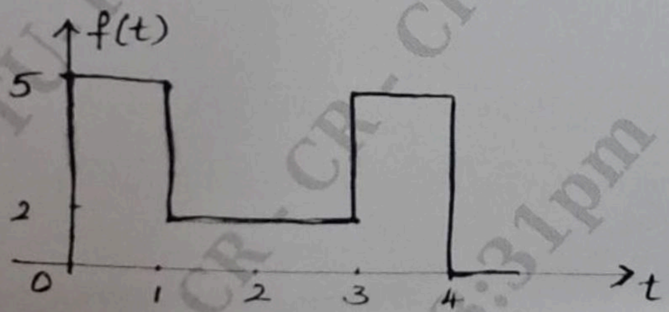


Fig.Q7(c)

OR

Q.8 a. Find the Laplace transform of the periodic waveform shown in Fig.Q8(a). (10 Marks, L3, CO3)

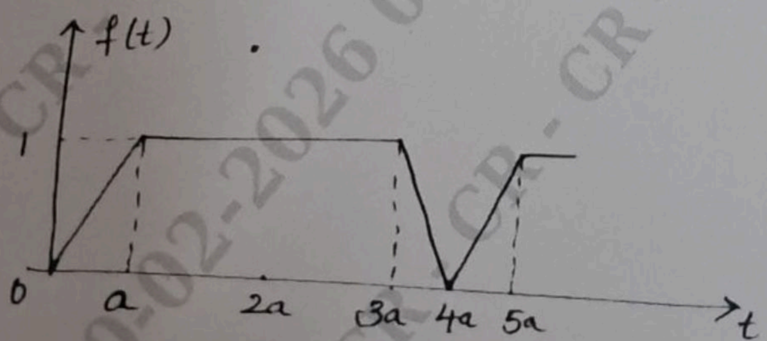


Fig.Q8(a)

b. Find the current i(t) when switch K is opened at t = 0 having reached steady state before the switching and the circuit is as shown in Fig.Q8(b). Also find the current at t = 0.5 sec. (10 Marks, L3, CO3)

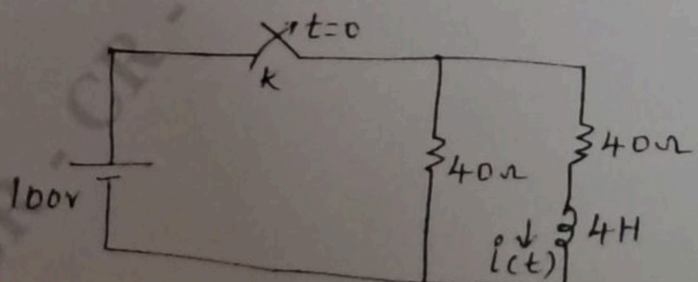
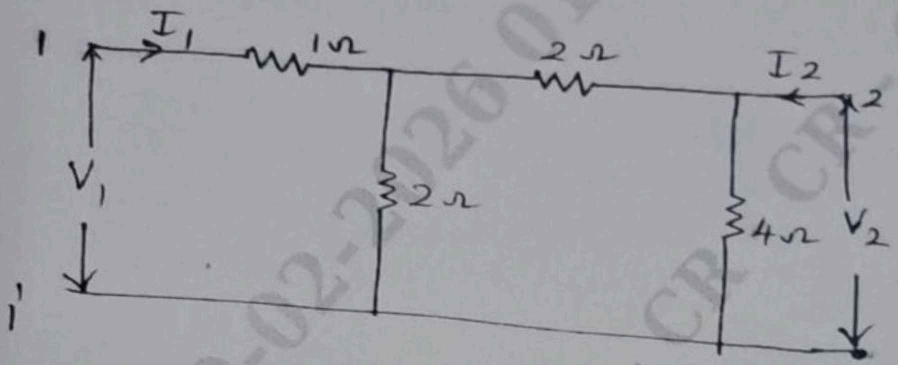


Fig.Q8(b)

Module – 5

Q.9	a.	Define Z and Y – parameters. Express Z-parameters in terms of Y.	10	L2	CO4
	b.	Obtain h – parameters for the network shown in Fig.Q9(b).  Fig.Q9(b)	10	L3	CO4

OR

Q.10	a.	Derive the expressions for Half-power frequencies for a series RLC circuit.	10	L3	CO4
	b.	A series RLC circuit has R = 10 Ω, L = 0.3H and C = 100 μF. The applied voltage is 230 V, find : i. The resonant frequency ii. The quality factor iii. Lower and upper cut-off frequency iv. Bandwidth.	10	L2	CO4

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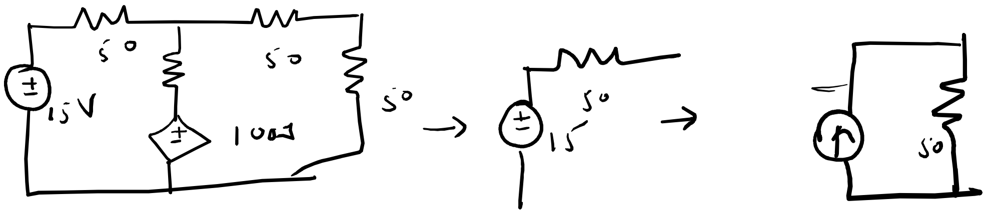
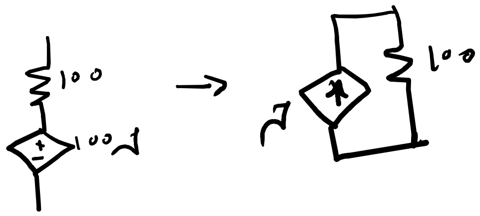
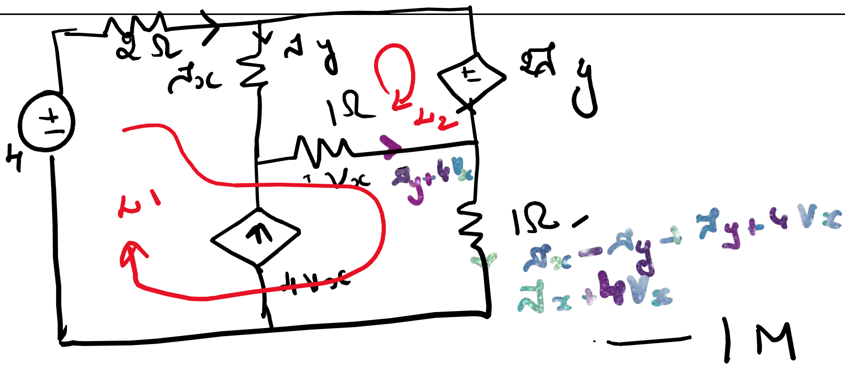
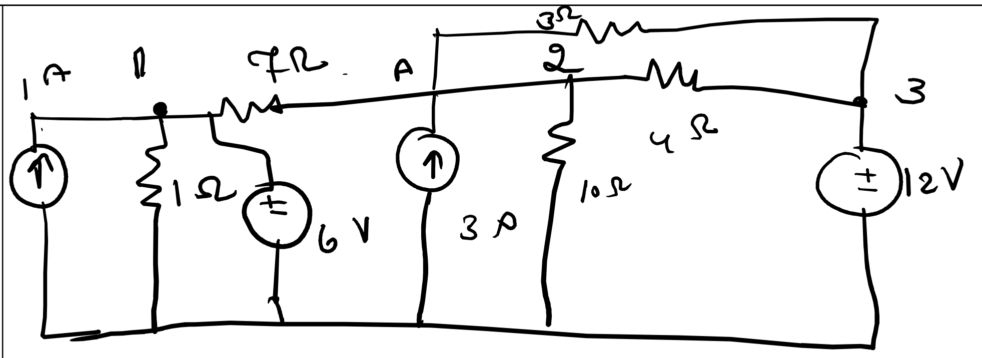
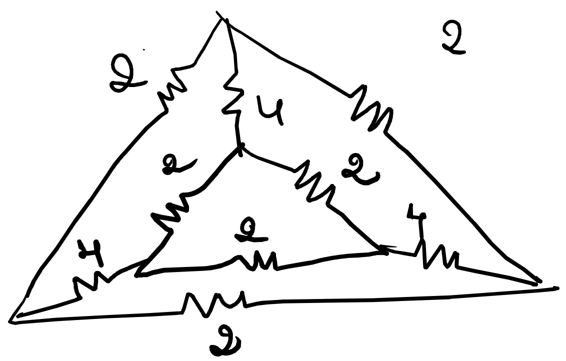
1a	 — 2M  — 2M. $i = 0.043\,A$ $V_2 = 8.6\,V$ — 1 M.	5
1b	 — 1M L1 $4 - 2i_x - V_x - i_x - 4V_x = 0$ $4 - 3i_x - 5V_x = 0$ — (2) L2, $-2i_y + V_x + i_y = 0$ $V_x - i_y = 0 \Rightarrow V_x = i_y$ — 3 M $i_x = 1.33\,A$ $i_y = 1.33\,A$ — 3 M $P = 354\,W$ — 1 M.	8

1c	 At 1, $V_B = 6V$. $-1 + \frac{V_B}{1} + \frac{6 - V_A}{7} = 0$ $-3 + \frac{V_A - 6}{1} + \frac{V_A - 12}{3} + \frac{V_A}{10} + \frac{V_A - 12}{4} = 0$ —— 3 M. $V_A = 13.145$ —— 4 M	7
2a	 $R_A = \frac{R_{AB} \cdot R_{AC}}{\Sigma R_{AB}}$ $R_{AB} = R_A + R_B + \frac{R_A R_B}{R_C}$ —— 3M.	7

2b		7
2c		6

3a		6
3b		6
3c		8
4a		7

4b		7
4c		6
5a		10

5b		10
6a		10

6b		10
7a		6

7b		6
7c		8

8a		10
8b		10

9a		10
9b		10
10a		10

10b		10