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G.H. RAISONI COLLEGE OF ENGINEERING AND MANAGEMENT, WAGHOLI PUNE
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Department: FY B TECH Term/Sution - II
Date of Examination: 23/06/21
Subject Name/Code: MODELING OF DIGITAL CIRCUITS (UECL103)
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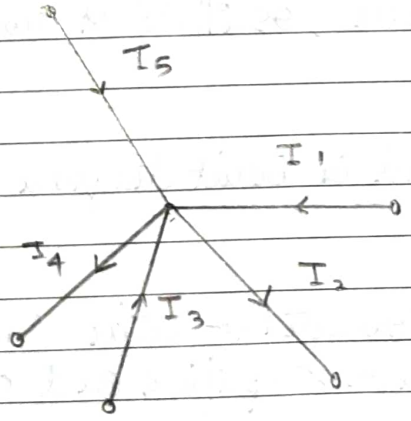
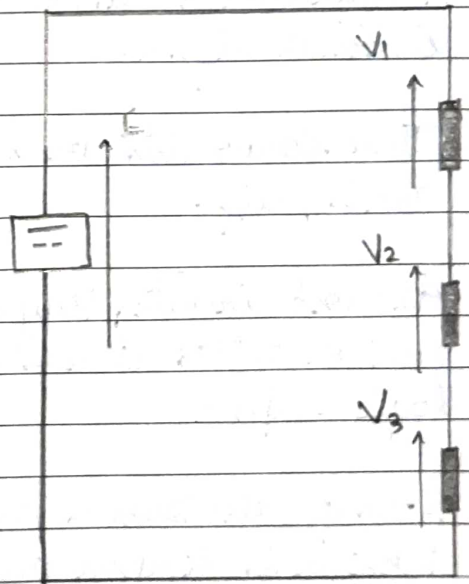
CO1 a.) The KCL law states that, in a closed circuit, the entering current at node is equal to the current at node is equal to the current leaving the node.



Kirchhoff's first Law.



$E - V_1 - V_2 - V_3 = 0$.

Kirchhoff's Second Law.

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Kirchhoff's laws mainly deal with voltage and current in the electrical circuits.

CO1 b.) Passive devices or components do not generate energy, but can store it or dissipate it.
Passive devices are the main components used in electronics such as resistors, inductors, capacitors and transformers which together are required to build any electrical or electronic circuit.

Properties: Passive devices do not provide gain, amplification or directionality to a circuit but instead provide attenuation as they always have a gain less than one, unity.

Passive devices can not generate, oscillate or amplify an electrical signal.

These components are labeled in circuit diagram as Rs, Cs and Ls, resp.

In most circuits, they are connected to active elements, typically semiconductors devices such as amplifiers and digital logic chips.

CO2 a.) K-map also known as Karnaugh maps simplification technique is simpler and less error-prone compared to other methods.
It prevents the need to remember each and every Boolean (expression) algebraic theorem.

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The K-map reduces the need for extensive calculations by taking advantage of human's pattern - recognition pattern.

K-maps are used to convert the truth table of a Boolean equation into minized SOP form.

Easy and simple basic rules for the simplification.

(Q2 b.) DeMorgan Law for three input P, Q and R is:

$\overline{P+Q+R} = \overline{P}.\overline{Q}.\overline{R}$ $\quad \overline{P.Q.R} = \overline{P}+\overline{Q}+\overline{R}$.

P	Q	R	P+Q+R	P.Q.R	$\overline{P+Q+R}$	$\overline{P}.\overline{Q}.\overline{R}$
0	0	0	0	0	1	1
0	0	1	1	0	0	0
0	1	0	1	0	0	0
0	1	1	1	0	0	0
1	0	0	1	0	0	0
1	0	1	1	0	0	0
1	1	0	1	0	0	0
1	1	1	1	1	0	0

=

From the above truth table we have verified

Hrly we prove for $\overline{P.Q.R} = \overline{P}+\overline{Q}+\overline{R}$.

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P	Q	R	P.Q.R	$\overline{P.Q.R}$	$\bar{P}$	$\bar{Q}$	$\bar{R}$	$\bar{P}+\bar{Q}+\bar{R}$
0	0	0	0	1	1	1	1	1
0	0	1	0	1	1	1	0	1
0	1	0	0	1	1	0	1	1
0	1	1	0	1	1	0	0	1
1	0	0	0	1	0	1	1	1
1	0	1	0	1	0	1	0	1
1	1	0	0	1	0	0	1	1
1	1	1	1	0	0	0	0	0

From the above truth table.

$\overline{P.Q.R} = \bar{P}+\bar{Q}+\bar{R}$ is verified.

For forms of DeMorgan Law are –

$(P.Q.R)' = P'+Q'+R'$

$(P+Q+R)' = P'.Q'.R'$

c.) Logical Equation given is $F=(L+M)(LN+L\bar{N})+LM+\bar{M}$

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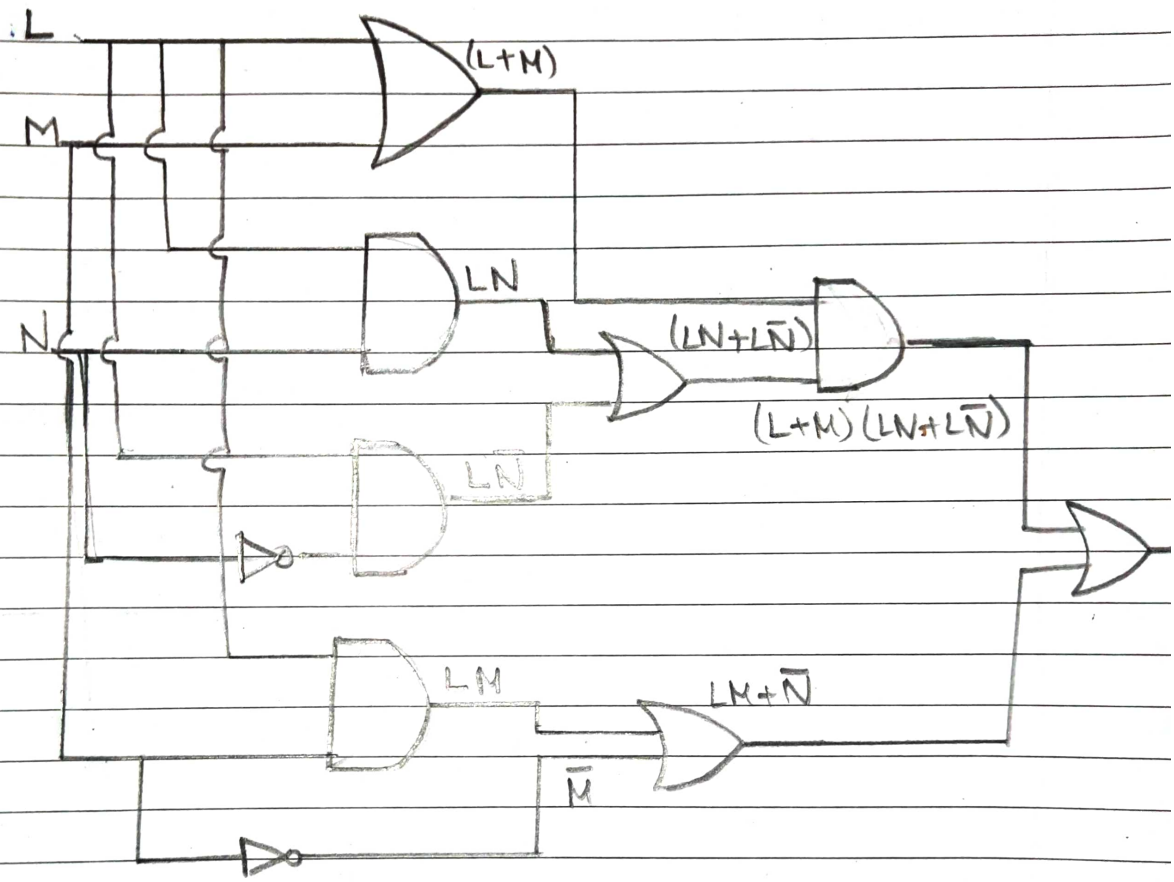
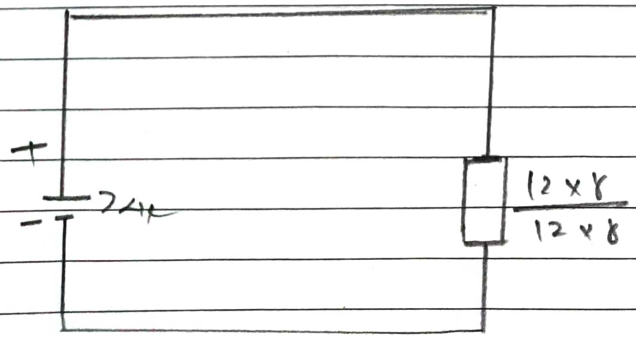


(01c.) In figure R1 is parallel to R2 so therefore.



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So Now, $I_T = \frac{V}{R}$

$$I = \frac{24}{\frac{96}{20}} = \frac{24 \times 20}{96} = \frac{480}{96}$$

$$I = 5A$$

Hence the current in the circuit is 5A.