

First - SIT 12 HOURS ASSESSMENT QUESTION PAPER:

Module Code: MA4001NI

Module Title: Logic and Problem Solving

Module Leader: Ashok Dhungana (Islington College)

Date:

Day / Evening: Day

Start Time:

Duration: 12 HOURS

Test Type: 12 HOURS ASSESSMENT

Materials permitted:

Warning:

candidates:

Candidates are warned that possession of unauthorised

materials in a test is a serious assessment offence.

Instructions to Please Note: Inclusive of this cover page, this test paper

consists of 3 pages and 10 Questions. The student

must complete all Questions.

This test accounts for 25% of your total module marks.

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Marks will be awarded for correctness and appropriate presentation of the answers.

Attempt all the questions.

1. Check the validity of the following argument:

If you are a flower lover, then you work in the garden. If you don't like roses, then you don't work in the garden. Therefore, if you are flower lover, then you like roses.

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[10 marks]

2. Verify De Morgan's laws using truth table .

	According to De Morgan 1 1aw (A.B) = 1+13									
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[10 marks]

3.

a) Construct a truth table to show that $(p \to q) \leftrightarrow (\neg p \ V \ q)$ is a tautology.

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[5 marks]

b) Show that \neg (p \lor (\neg p \land q)) and (\neg p \land \neg q) are logically equivalent by using laws.

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L'H'S = T(PV(TPAQS))

= T(PVTP) A (PAVQS) (TDbtrbutive law)

= T(True A (PVQS) (Complement law)

= T(PXQ) (Tdentity law)

= TPATQ (De Morgan law)

= R'H'S

Proved
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[5 marks]

4. Provided the output function:

$$X = A. B. C + A. B. C + A. B. C + A. B. C$$

- a) Using the laws, simplify the expression as much as possible. [6 marks]
- b) Construct the logic circuit of the simplified expression.

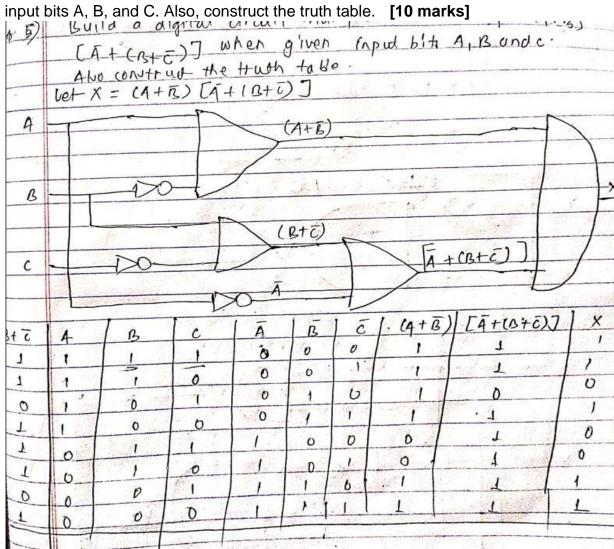
[2 marks]

c) Construct the truth table of the simplified expression.

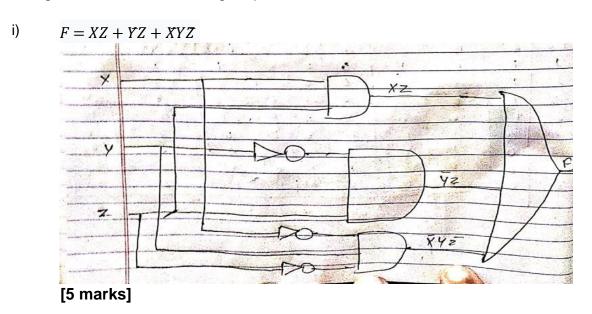
[2 marks]

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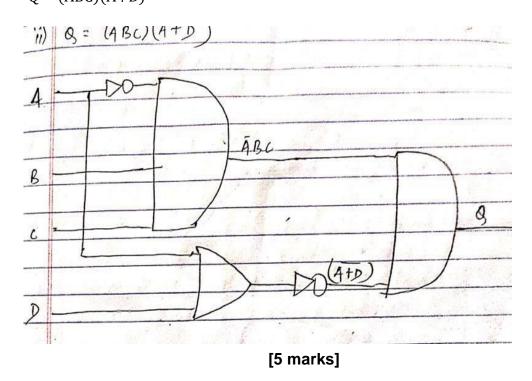
5. Build a digital circuit that produces the output (A + B) [A + (B + C)] when given input bits A. B. and C. Also, construct the truth table. [10 marks]



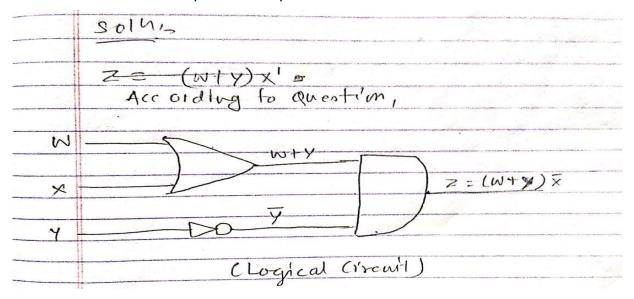
6. Draw the logic circuit for the following output functions.



Logic and Problem Solving: First - Sit 12 hours Assessment ii) $Q=(\bar{A}BC)(\bar{\bar{A}}\bar{+}\bar{\bar{\bar{D}}})$



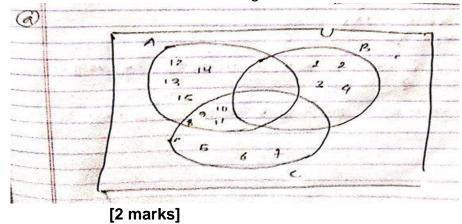
7. A system uses 3 switches W, X and Y; a combination of switches determines whether an alarm, Z, sounds. If switch W or switch Y are in the ON position and switch X is in the OFF position then a signal to sound an alarm, Z, is produced. Design the logic of the circuit using the appropriate logic gates and construct the truth table to show all possible output.



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[10 marks]

- **8.** Given U= $\{1, 2, 3, ..., 15\}$. A= $\{x: x \in U, x \ge 8\}$, B= $\{x: x \in U, x \le 4\}$ and C= $\{x: x \in U, 4 < x < 12\}$.
 - a) Put all the information on Venn Diagram



b) Find $A \cap C$

c) Find B U C

d) Find (A U C) - Be) Find (AU B) - (A∩ B)

[2 marks]

[2 marks] [2 marks]

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Find Anc

A = $ 8,9 - 153 , C = $ = 16,7 (7,18,18)  

A n c = $ 2,9,10,11  

O Find Ruc & R = $ 1,2,3,413, 7 = $ = 16,3,7,7,18  

Ruc = $ 1,2,3,418,6,7,7,16,13  

A = $ 2,9,--153, C = $ 5,6 = 113  

A uc = $ 5,6,7,8,9,10,11,12,12,14,15  

= $ 5,6,7 - 153 - $ 1,2,2,42  

= $ $ End (Aur) - (Anr)

A = $ 2,9,10 - 153  

R = $ 1,2,7,43  

(Aur) = $ 1,2,2,4,8,9,10,11,12,13,14,15  

[Anr) = $ 0

Aur) - (Anr) = $ 1,2,2,4,8,9,10,11,12,13,14,15  

[Aur) - (Anr) = $ 1,2,2,4,8,9,10,10,11,12,13,14,15  

[Aur) - (Anr) = $ 1,2,2,4,8,9,10,10,11,12,13,15  

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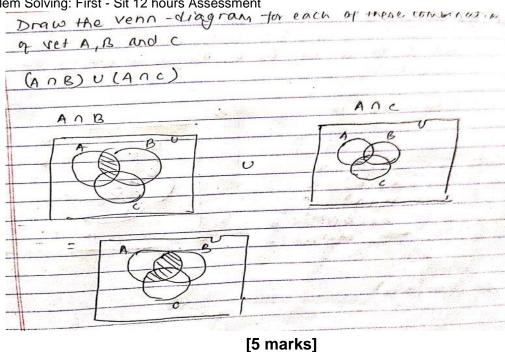
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[Aur] - (Aur) - (Aur) - (Aur) - (Aur) - (Aur) - (Aur)
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[2 marks]

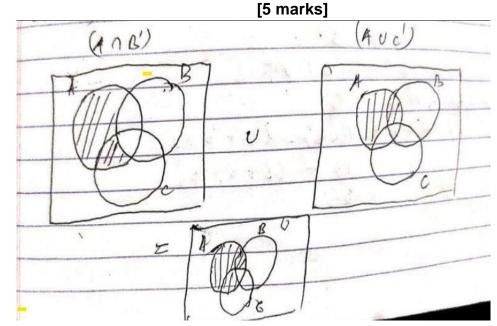
9. Draw the Venn diagrams for each of these combinations of the sets A,B and C.

a) $(A \cap B) \cup (A \cap C)$



b) (A ∩ B') ∪ (A ∩ C')





10. In a group of students 18 read Books, 19 read Magazines and 16 read Novels. 6 read Books only, 9 read Magazines only, 5 read Books and Magazines only and 2 read Magazines and Novels only.

a) Put all the information in Venn- Diagram.
b) How many students read all three?
c) How many read Books and Novels only?
d) How many read Novels only?
e) How many students are there all together?
[2 marks]
[2 marks]
[2 marks]
[2 marks]

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let B, M, N be								
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no(M) = 9	37 2							
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= 7	= 7							
e) $n/n1 = 6 + 5 + 9$	+4+3+2+7							
= 36								

The End