U-5710

M. A. / M. Sc. (Sem. II) Examination, 2021

Mathematics

Paper - MATH 2C(v)

Discrete Mathematics-II

Time Allowed : **Three Hours**

Maximum Marks : **70**
Min. Pass Marks : **28**

Note : *This question paper will be divided into three section as under :*

Section-A **Max. Marks - 10**

This section contains 01 compulsory question comprising 10 short answer type questions (maximum 20 words answer) taking two questions from each unit. Each question shall be of one mark.

Section-B ***Max. Marks-25***

This section contains 10 questions, 02 questions from each unit (answer about in 250 words). Students are instructed to attempt five questions by selecting one question from each unit. Each question shall be of five mark.

Section-C ***Max. Marks-35***

This section contains five long answer type questions comprising one compulsory question (question no. 07) of 15 marks and four questions of 10 marks each. Students are instructed to attempt total three questions with one compulsory question (answer about in 500 words) and any two more questions (answer about in 400 words) out of ramaining four questions.

SECTION - A

1 (i) Define the sets and Propositions.
(ii) Define the Principla of Mathematical induction.
(iii) Define implication.
(iv) Define the Predicates.
(v) Define Boolean function.
(vi) Explain the digital logic gates.
(vii) Define the directed graph.
(viii) Define binary search tree.
(ix) Explain duality in lattices.
(x) Define the complemented lattices.

SECTION - B

UNIT - I

2 Show the $n^3 + 2n$ is divisible by 3 for $n \geq 0$

OR

Let 100 of the 120 students of mathematics at a college take at least one of the languages Hindi, English and German. Also, 1st 65 study Hindi, 45 study English and 42 German. If 20 study Hindi and English, 25 study English and German and 15 study Hindi and German. Find the number of students who study all the three langugaes.

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UNIT - II

3 Test the validity of the following argument :
If I like mathematics then I will study
Either I study or I fail
Therefore, If I fail, then I do not like mathematics.

OR

Give a proof by contradicion of the theorem, "if $3n + 2$ is odd, the n is odd".

UNIT - III

4 Prove that the value of complete disgunctive normal form of a Boolean function is reduced to indentically one.

OR

Design a circuit using gates to realize the following :
$F = (x + yz)(y + zx^1)$

UNIT - IV

5 Let G be the connected, plainer simple graph with e-edges, v-vestices, if r be the No of region in a planer graph representing G then $r = e - v + 2$

OR

Display a binary tree with 11 vertices and height 5. Also write the difference between binary tree and complete binary tree.

UNIT - V

6 Show that if TS not necessary that union of two sub latticas TS again a sublattices.

OR

Let L be a bounded distributive lattices then complements are unique if they exists.

Section-C

7 (i) A group of six people, where any two of them are either friends or strangers. Show that there are three of them which are either mutual friends or mutual strangers.

OR

(ii) Prove that for the two sets A and B $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

8 (i) Express the statement "everyone has exactly one best friend" as a logical expression using quantifiers.

(ii) With the help of truth table prove that, $\sim (P \rightarrow q) \equiv P \wedge \sim q$

9 If $< B, +, . >$ is a boolean algebra, then prove that
$(xy^1 + yz) \cdot (xz + yz^1) = xz$.

10 Consider the algebraic expression $E \equiv (3x - y)(8a + b)^4$ involve only binary operations. Draw the binary tree T which corresponds to expression E.

11 if L ($\wedge$, $\vee$) be a complemented and distributive lattices then for any a, b $\in$ L
$\overline{a \vee b} \equiv \bar{a} \wedge \bar{b}$
$\overline{a \wedge b} \equiv \bar{a} \vee \bar{b}$