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(20222) Roll No. ....

B.Sc.(Com.Sci.)-III Sem.

NP-3602 (CV-III)

B.Sc. (Computer Science)

Examination, Dec.-2021

DISCRETE STRUCTURE

(BCS-301)

Time : 1½ Hours] **[Maximum Marks : 75**

Note : Attempt **all** the sections as per instructions.

Section-A

Note : Attempt any **two** questions. Each question carries **7.5** marks.

2×7.5=15

1. Consider the function f: N→N, recursively given by f(0)=1 and f(n+1)=2−f(n). Find f(10).

2. How many Lattice paths start as (3, 3) and end at (10, 10)?

P.T.O.

9. (a) Prove that the maximum number of nodes in a binary tree of depth α is $2^{\alpha}-1$, where $\alpha \geq 1$.

(b) Show that the set M of all elements {0, 1, 2, 3, 4, 5} with addition modulo 6 and multiplication modulo 6 as a composition is a ring with zero divisors.

OR

Show that the set M of all matrices of the form $\begin{bmatrix}1 & n\\0 & 1\end{bmatrix}$ where $n \in z$ is a semigroup under multiplication and it is isomorphic to (Z, +).

10. (a) Prove that product of two lattices is a lattices.

(b) State and prove DeMorgan's law of Boolean Algebra.

P.T.O.

3. Find the order of the elements of $(z_8, +_8)$

4. Define multi graph with example.

5. Use a membership table to show that: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

Section-B

Note : Attempt any **one** question out of the following three questions. Each question carries 15 marks. 1×15=15

6. Show that there are only two non isomorphic groups of order 4.

7. Show that in a Boolean algebra, the idempotent laws $X \vee X = X$ and $X \wedge X = X$ holds for every element X.

8. Give an example of a graph which is Hamiltonian but not Eulerian and vice-versa.

Section-C

Note : Attempt any **two** questions out of the following five questions. Each question carries 22.5 marks.

2×22.5=45

11. (a) Define K-regular graph. Give example of 2 regular, 3-regular, 4-regular graphs.

(b) Show that the function f<x, y>= x+y is primitive recessive.

(c) Use mathematical induction to show that

$$\sum_{K=1}^{n} K^2 = \frac{n(n+1)(2n+1)}{6}$$

12. (a) State and prove pigeonhole principle.

(b) Define minimum spanning tree.

(c) Negate the statement: Every city in Canada is clean.

13. (a) Prove that a simple graph has a spanning tree iff it is connected.

(b) If a group has four elements, show that it must be abelian.