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(20221) Roll No.
B.Sc.(C.S.)-III Sem.

NP-3602

**B.Sc. (Computer Science)
Examination, Dec. - 2020**

DISCRETE STRUCTURES

(BCS-301)

Time : Three Hours / [Maximum Marks : 75

Note : Attempt questions from each Section as per instructions.

Section - A

(Very Short Answer Questions)

Note : Attempt all five questions of this section. Each question carries 3 marks. Very short answer is required.

3×5=15

1. If $A=\{1, 3, 5, 7\}$, $B=\{2, 3, 5\}$, $C=\{5, 6, 8, 9\}$ and $U=\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$. Find 3
 - (i) $(A \cup B \cup C)'$
 - (ii) $(B - C)'$

2. Define Euler graphs with example. 3
3. State the pigeonhole principle. 3
4. Define conjunction statement with example and construct the truth table.3
5. Define Bounded lattice. 3

Section - B

(Short Answer Questions)

Note : This section contains three questions, attempt any two questions. Each question carries 7½ marks.

7½×2=15

6. Define logic gates. Explain 'XOR', 'AND', and 'NOT' logic gates with logic diagram and truth table. 7.5
7. Solve the recurrence relation: 7.5
 $a_{(n+1)} - a_n = 3n^2 - n, n \geq 0, a_0 = 3$
8. Using the principle of mathematical induction, prove that: 7.5
 $1.2 + 2.3 + 3.4 + \dots + n(n+1) = \frac{1}{3} n(n+1)(n+2)$ 7.5

Section - C

(Detailed Answer Questions)

Note : This section contains **five** questions, attempt any **three** questions. Each question carries 15 marks.

15×3=45

9. (a) Define Normal Subgraph. Show that the set of all positive rational numbers forms an abelian group under the composition defined by

$a * b = \frac{(ab)}{2}$ 8

(b) The intersection of any two normal subgroups of a group is a normal subgroup. 7

10. (a) Prove that De Morgan's laws hold good for a complemented distributive lattice $\langle L, \wedge, \vee \rangle$, viz $(a \vee b)' = a' \wedge b'$ and $(a \wedge b)' = a' \vee b'$ 7

(b) In any boolean algebra, show that $(a+b)(b+c)(c+a) = ab+bc+ca$ 8

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P.T.O.

11. (a) Prove that if a graph (connected or disconnected) has exactly two vertices of odd degree, then there exists a path joining these two vertices. 8

(b) Prove that every connected graph with n vertices and n-1 edges is a tree. https://www.ccsustudy.com 7

12. (a) State the Pigeonhole Principle. If any 51 integers are chosen from the set {1, 2, 3,, 100} then show that among the chosen integers there exist two integers such that one is multiple of the other. 8

(b) Prove that a graph is bipartite iff all its circuits are of even length. 7

13. Write short notes on any **three** from the following. 3×5=15

(a) Logical implicational and logical equivalence.

(b) Hamiltonian Graph and Chromatic Number.

(c) Tree and Tree Traversal.

(d) Group and cyclic group.

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