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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

   $1.2+2.3+3.4+\ldots\ldots\ldots\ldots+n(n+1)=\frac{1}{3}$

   $n(n+1)(n+2)$ 7.5

Section - C

(Detailed Answer Questions)

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

$15 \times 3 = 45$

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

11. (a) Prove that if a graph (connected or disconnected) has exactly two vertices of odd degree, than 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. 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. $3 \times 5 = 15$

    (a) Logical implicational and logical equivalence.

    (b) Hamiltonian Graph and Chromatic Number.

    (c) Tree and Tree Traversal.

    (d) Group and cyclic group.