

**A**  
**(21119)**

Roll No. \_\_\_\_\_

Total Questions : 13 ]

[ Printed Pages : 4

## NP-3602

B.Sc. (Computer Science) IIIrd Semester  
Examination, Nov., 2019

### DISCRETE STRUCTURES

(BCS-301)

Time : 3 Hrs. ]

[ M.M. : 75

**Note** :- Attempt all the Sections as per instructions.

#### Section-A

**(Very Short Answer Type Questions) 3×5=15**

**Note** :- Attempt all the *five* questions. Each question carries 3 marks.

1. Show that the mapping  $f : \mathbb{R} \rightarrow \mathbb{R}$  be defined by  $f(x) = 3x + 4$ , where  $x \in \mathbb{R}$  is invertible. Find its inverse.

**ND-111**

( 1 )

Turn Over

2. Let  $X = \{1, 2, 3, 4, 5, 6\}$ , then  $/$  is a partial order relation on  $X$ . Draw the Hasse diagram of  $(X, /)$ .

3. Show that the permutation  $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 5 & 6 & 2 & 4 & 1 & 3 \end{pmatrix}$  is odd.

4. Construct a truth table for the proposition  $(p \vee \neg q) \wedge p$ .

5. Define simple graph and multigraph with example.

#### Section-B

**(Short Answer Type Questions) 7½×2=15**

**Note** :- Attempt any *two* questions out of the following three questions. Each question carries 7½ marks.

6. If  $A$  and  $B$  are two sets, then prove that :

$$(A \cup B)' = A' \cap B'$$

7. Explain Graph Coloring.

8. Let  $G$  be a finite group and  $H$  be a subgroup of  $G$ . Show that  $O(H)/O(G)$ .

**ND-111**

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**Section-C**

**(Long Answer Type Questions)** 15×3=45

*Note :-* Attempt any *three* questions out of the following five questions. Each question carries 15 marks.

9. (a) State and prove pigeonhole principle.  
(b) Show that  $n^2 > 2n + 1$  for  $n \geq 3$  by mathematical induction.

10. Define a group. Prove that the fourth roots of unity 1,  $-1$ ,  $i$ ,  $-i$  form an abelian group under multiplication.

11. (a) Use Karnaugh map to simplify the expression :

$$X = A'B'C'D' + AB'C'D' + A'B'CD' + AB'CD'$$

(b) Let  $A = \{1, 2, 3, 4\}$  and consider the relation :

$$R = \{(1, 1), (2, 1), (2, 2), (3, 1), (3, 3), (3, 4), (4, 4)\}.$$

Show that  $R$  is a partial ordering.

12. Solve the Recurrence relation :

$$a_{n+2} - 5a_{n+1} + 6a_n = 2$$

with initial conditions  $a_0 = 1, a_1 = -1$ .

13. (a) Explain the basic logical operations of propositional calculus.

(b) Negate the statement using quantifiers. For all real numbers  $x$ , if  $x > 3$  then  $x^2 > 9$ .