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 $f : R \to R$ be defined by $f(x) = 3x + 4$, where $x \in R$ is invertible. Find its inverse.

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).

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 $x^2 > 9$.