Roll No. : .....

Total No. of Questions : **10**] [Total No. of Printed Pages : **3**

BPF–2225

M.Sc. (Final) Examination, 2022

COMPUTER SCIENCE

Paper – MCS–204

(Discrete Mathematics)

*Time : **3** Hours*] [*Maximum Marks : **100***

Note :– Attempt *five* questions in all, selecting *one* question from each Unit. All questions carry equal marks.

Unit–I

1. (a) Explain the truth tables of the following with examples for two variables :

   (i) X OR Y

   (ii) X AND $\bar{Y}$

   (iii) $\bar{X}$ OR $\bar{Y}$

   (iv) Y AND $\bar{X}$

   (b) Prove the following using mathematical induction :

   $1 + 2^n < 3^n$ for $n \geq 2$ 10×2=20

2. Explain each of the following :

(a) Tautologies

(b) Biconditional

(c) Power set

(d) Logical equivalence

(e) Venn diagrams 4×5=20

Unit–II

3. (a) Write algorithm to find the smallest number of given three integers.

(b) Write a recursive function to find the factorial of a given number. 10×2=20

4. (a) What are the properties of equivalence relations ? Explain the concept with suitable example.

(b) Suppose a relation R(> =) is defined over following set A. Represent the following relation graphically/pictorially and in matrix form :

$$A = \{2, 4, 5, 9, 12\}$$ 10×2=20

Unit–III

5. Draw the Hasse diagram for a partial order that has ten elements. You may take suitable assumptions and mention these assumptions. You may take the POSET of your choice with 10 elements. 20

6. Explain the following :

(a) Karnaugh map

(b) Isomorphic order sets

(c) Supremum

(d) Well order sets

(e) Duality in Boolean algebra. 4×5=20

Unit–IV

7. (a) Expand the following expression using binomial theorem :

$$(x + 7)^5$$

(b) In a family, there are 6 members. How many ways are possible to take the family picture ? Assume at least 5 members must be there in a picture and all members are sitting in a single row. 10×2=20

8. (a) Explain the concept of Pascal's triangle and how to find the binomial coefficients using it.

(b) Out of 13 players, how many different Cricket teams (of 11 players) are possible ? 10×2=20

Unit–V

9. Describe each of the following :

(a) Spanning tree

(b) Depth first search

(c) Binary tree

(d) Undirected graph 4×5=20

10. (a) Write the steps for Kruskal's algorithm and explain using suitable example.

(b) Write the adjacency matrix of a relation (with eight elements) of your choice. Mention the assumptions you have taken while writing. 10×2=20