

### Unit III

5. (a) Define Boolean Algebra. Prove that If  $n = p_1 p_2 p_3 \dots p_n$ , where  $p_i$  are distinct primes, known as set of atoms, then  $D_n$  is a Boolean algebra. **10**
- (b) State and prove representation theorem. **10**
6. (a) Discuss Karnaugh map for one, two and three variables. Also simplify : **10**
- $$y = \bar{x}_1 x_2 \bar{x}_3 + x_1 x_2 \bar{x}_3$$
- (b) Define Half-Adder and Full-Adder. Also find the Boolean expression  $E(x, y, z)$  corresponding to the truth table  $T(E) = 00010001$ . **10**

### Unit IV

7. (a) Define Graph and prove that following :
- (i) State and prove Euler's theorem on graph (first theorem of graph theory).

M-CC313

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No. of Printed Pages : 05

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**CC313**

**M.Sc. EXAMINATION, May 2019**

(Third Semester)

(B. Scheme) (Re-appear)

MATHEMATICS

MAT605B

DISCRETE MATHEMATICS

*Time : 3 Hours]*

*[Maximum Marks : 100*

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Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

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**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

(3-36/19)M-CC313

P.T.O.

## Unit I

1. (a) What do you mean by recurrence relation? Find an explicit formula for the sequence defined by the recurrence relation

$$a_n = a_{n-1} + 2a_{n-2}, n \geq 2$$

with the initial conditions

$$a_0 = 1 \text{ and } a_1 = 8. \quad \mathbf{10}$$

- (b) Define total solution and particular solution of a difference equation. Find the particular solution of the difference equation :

$$a_n - a_{n-1} - 2a_{n-2} = 2n^2$$

also write down the total solution. **10**

2. (a) Define numeric and generating functions. Find the generating function of the number function :

$$a_n = 1^n + 2^n + 3^n, n \geq 0$$

Also find the numeric function corresponding to generating function. **10**

- (b) Using generating function method, find the explicit formula for Fibonacci sequence. **10**

## Unit II

3. (a) State and prove pigeonhole principle. Also solve the following :

How many people at least in a group of 85 peoples have the same last initials ?

**10**

- (b) Define partially ordered set, chain and Lexicographic order. Also.

Prove that the diagram of partial order has no cycle of length greater than I. **10**

4. (a) Discuss conditional and biconditional statement prove :

If  $p$  and  $q$  are propositions, then :

$$p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p) \quad \mathbf{10}$$

- (b) Define Lattice and state properties of Lattices.

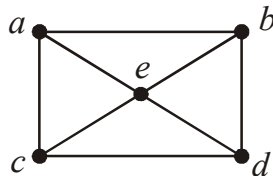
Also describe lattice as algebraic system.

**10**

- (ii) Is there a graph with eight vertices of degree 2, 2, 3, 6, 5, 7, 8, 4 ?

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- (b) Define Hamiltonian path and Hamiltonian circuit. Does the graph  $G$  given below have Hamiltonian Circuit ?



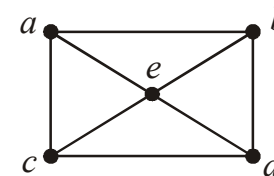
10

8. (a) Define tree. Prove that for any positive integer  $n$ , a tree with  $n$  vertices has  $n - 1$  edges. 10
- (b) Define spanning tree of a graph, prove that a graph  $G$  has a spanning tree iff  $G$  is connected. 10

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