

(b) Prove that any open interval  $(a, b)$  is equivalent to any other open interval  $(c, d)$ .

7. (a) Explain with one example of each of the following functions :
- (i) Hash function
  - (ii) Floor function
  - (iii) Characteristic function.
- (b) Find the number of distinguishable permutations that can be formed from a collection of  $n$  objects in which the first object appears  $k_1$  times, the second appears  $k_2$  times and so on. Hence find the number of distinguishable permutations of the letters in MATHEMATICS.

#### Unit IV

8. (a) Define a generating function. Find the generating function of the sequence is  $a_n = n + 1$ .

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Roll No. ....

**AA-344**

**B. Sc. (Hons.) EXAMINATION, Dec. 2017**

(First Semester)

(Dual Degree) (Main & Re-appear)

MATHEMATICS

MAT-217-H

Discrete Mathematics-I

*Time : 3 Hours*]

*[Maximum Marks : 75*

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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. Q. No. 1 is compulsory. All questions carry equal marks.

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**P.T.O.**

1. (a) Let  $A = \{a, b, c, d\}$ . Write the members of  $P(A)$ . Verify the result by 'the result of  $|A| = n$ , then  $|P(A)| = 2^n$ .
- (b) Express union, intersection, difference and complement of sets by Venn diagrams.
- (c) Draw the truth table to prove that :
 
$$p \rightarrow q \equiv \neg p \vee q$$
- (d) Show that the number of  $r$ -combinations out of  $n$  elements with repetition allowed is  $\binom{n+r-1}{r}$ .
- (e) Find the total solution of the recurrence relation  $a_n - 4a_{n-1} + 5a_{n-2} = 2$ .

### Unit I

2. (a) Verify the relation  $A \Delta B = (A \cup B) - (A \cap B) = (A - B) \cup (B - A)$  for the sets  $A = \{1, 2, 3\}$ ,  $B = \{2, 3, 4, 5\}$ .
- (b) Prove that there is no largest cardinal number.

3. (a) If  $R$  is a partial order on  $A$ , then  $R^{-1}$  is also a partial order.
- (b) How many people among 4,00,000 people are born at the same time ?

### Unit II

4. (a) Explain basic logical operations with truth tables and *one* example of each.
- (b) State and prove Identify law of logics.
5. (a) Explain Quantifiers.
- (b) Use mathematical induction to show that :
 
$$n! \geq 2^{n-1}, n = 1, 2, 3, \dots$$

### Unit III

6. (a) How many five-persons committee can be constituted from a group of six men and five women consisting of :
  - (i) at least one man
  - (ii) at most one man.

- (b) Find the particular solution of the difference equation :

$$a_n - 5a_{n-1} + 6a_{n-2} = 3^n + n$$

9. (a) Find the particular solution of the difference equation :

$$a_n + 5a_{n-1} + 6a_{n-2} = 3n^2 - 2n + 1$$

- (b) Solve the recurrence relation by generating function :

$$a_n - 4a_{n-1} = 6 \cdot 4^n, a_0 = 1$$

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