

Roll No. ....

**91056**

**B. Sc. (1st Sem.) Maths (Honours)  
Examination – December, 2015**

**DISCRETE MATHS**

Paper : BHM-114

**Time : Three Hours ] [ Maximum Marks : 60**

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

**Note :** Attempt five questions in all, selecting one question from each Section. Question No. 9 is compulsory.

**SECTION – I**

1. (a) Out of 40 students in a class, 16 study English, 22 Math and 26 Eco. 5 study English and Eco., 14 Math and Eco and 2 study all the three subjects. If each student studies at least one of the three subjects, find the number of students who study :
- (i) English and Math.
  - (ii) English but not Math or Eco.
  - (iii) English, Math but not Eco.
- (b) Prove that Q is countable set.

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(ii)  $\frac{5+z^2}{1-4z^2}$

- (b) By finding generating function of sequence  $S_n$ , find solution of recurrence relation :

$$S_{n+2} - 7S_{n+1} + 12S_n = 0 \text{ for } n \geq 0$$

$$\text{Given } S_0 = 2, S_1 = 5.$$

**SECTION – V**

9. (a) Define Homogenous Recurrence relation.  
(b) Define an abelian group with example.  
(c) Find the contrapositive and Inverse of the following statement.  
"If  $4x - 2 = 10$ , then  $x = 3$ "  
(d) How many numbers must be selected from the set  $\{1, 2, 3, 4, 5, 6\}$  to guarantee that at least one pair of these numbers add up to 7?  
(e) Define countable set.  
(f) The number of diagonals of a polygon is 20. Find the number of its sides.

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2. (a) Prove that  $2^{3n} - 1$  is divisible by 7.

(b) In  $\mathbb{N} \times \mathbb{N}$ , show that the relation defined by  $(a,b)R(c,d)$  if and only if  $ad = bc$  is an equivalence relation.

### SECTION - II

3. (a) Write down the truth table for the following statement patterns :

(i)  $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$

(ii)  $(p \rightarrow q) \rightarrow [(q \rightarrow r) \rightarrow (p \rightarrow r)]$

(b) Test the validity of : If he works hard then he will be successful. If he is successful than he will be happy. Therefore, hard work leads to happiness.

4. (a) Define with example :

(i) Tautology

(ii) Fallacy

(iii) Converse

(iv) Inverse

(v) Contrapositive

(vi) Equivalence

(b) Verify the validity of the statement "If the rainfall is good, the yield of crops is good. The yield of crops was not good. therefore, the rainfall was not good."

### SECTION - III

5. (a) How many three digit odd numbers can be formed from the digits 1, 2, 3, 4, 5, 0 when :

(i) Repetition of digits is not allowed.

(ii) Repetition of digits is allowed.

(b) Each coefficient in the equation  $ax^2 + bx + c = 0$  is determined by throwing an ordinary die. Find the possibility that the equation will have real roots.

6. (a) Show that the set  $= \{0, 1, 2, 3, 4\}$  is a ring w. r. t. the operation of addition and multiplication modulo 5.

(b) A has 3 shares in a lottery where there are 3 prizes and 6 blanks. B has one share in another where there is but one prize and two blanks. Show that A has a better chance of winning a prize than B in the ratio of 16 to 7.

### SECTION - IV

7. (a) Solve  $S_n - 4S_{n-1} + 3S_{n-2} = 5^n$ .

(b) Find a particular solution of  $a_n + 5a_{n-1} + 6a_{n-2} = 42.4^n$ .

8. (a) Write sequence whose generating function is :

(i)  $\frac{3-5z}{1-2z-3z^2}$