

MTT04-C/T04

M.Sc. I.T. I<sup>st</sup> Semester Examination 2017-18

## DISCRETE MATHEMATICS

Paper : IV

Time: Three Hours

Maximum Marks: 80

[Marks :20]

## PART – A (खण्ड-अ)

Answer all questions (50 words each)

All questions carry equal marks.

सभी प्रश्न अनिवार्य हैं। प्रत्येक प्रश्न का उत्तर पचास शब्दों से अधिक न हो।  
सभी प्रश्नों के अंक समान हैं।

[Marks :40]

## PART – B (खण्ड-ब)

Answer five questions (250 words each)

Selecting one question from each unit. All questions carry equal marks.

प्रत्येक इकाई से एक-एक प्रश्न चुनते हुए, कुल पाँच प्रश्न कीजिए।

प्रत्येक प्रश्न का उत्तर 250 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

[Marks :20]

## PART – C (खण्ड-स)

Answer any two questions (300 words each)

All questions carry equal marks.

कोई दो प्रश्न कीजिए। प्रत्येक प्रश्न का उत्तर 300 शब्दों से अधिक न हो।  
सभी प्रश्नों के अंक समान हैं।

Q. 1 (i) Define subset &amp; power set

(ii) If  $A = \{2, 3, 4, 6, 8\}$ ,  $B = \{1, 3, 4, 5, 7, 8\}$ find  $A \oplus B$ (iii) Find Domain of the function  $\frac{5}{x-3}$ 

(iv) Define Tautologies &amp; contradictions

(v) Given  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  and  $B = \begin{bmatrix} 5 & 6 \\ 0 & -2 \end{bmatrix}$ then find  $A^T B^T$ 

(vi) Find the value of determinant

$$\begin{vmatrix} 2 & -3 & 4 \\ 1 & 2 & -3 \\ -1 & -2 & 5 \end{vmatrix}$$

(vii) Find value of n if  ${}^nC_{13} = {}^nC_6$ 

(viii) Suppose a license plate contains two letters followed by three digits with first digit not zero. How many license plate can be printed.

(ix) For the integers  $a = -381$  and  $b = 14$ . Find integers  $q$  &  $r$  such that

$$a = bq + r \text{ and } 0 \leq r < |b|$$

(x) Give statement of fundamental theorem of Arithmetic.

**Part - B**  
**Unit - I**

Q.2 Set  $U = \{1,2,3,4,5,6,7,8,9\}$  and  $A = \{1,2,3,4,5\}$ ,  $B = \{4,5,6,7\}$ ,  $C = \{5,6,7,8,9\}$

Find (i)  $A' \cup B' \cup C'$

(ii)  $(B \cap C) - (A \cap C)$

(iii)  $(A \cap B) \cup (B \cap C)$

(iv)  $(A \cap C) - B$

Q.3 Let  $A$  be a set of non zero integers and let  $R$  be the relation on  $A \times A$  defined by  
(a,b)  $R$  (c,d) whenever  $ad=bc$   
Prove that  $R$  is an equivalence relation

**Unit - II**

Q.4 If  $f(x) = \frac{1}{1-x}$  then find  $f[f\{f(x)\}]$

Q.5 Determine the validity of the following argument if 7 is less than 4, then 7 is not a prime number.

7 is not less than 4  
7 is a prime number

**Unit - III**

Q.6 (a) Find the number of permutations that can be formed from the letters of the word ELEVEN.  
(b) How many of them begin and end with E?  
(c) How many of them have the three E's together?  
(d) How many begin with E and end with N?

Q.7 Determine the probability  $P$  of each event  
(a) An even number appears in the toss of fair die.  
(b) One or more heads appears in the toss of three fair coins  
(c) A red marble appears in random drawing of one marble from a box containing four white, three red and five blue marbles.

**Unit - IV**

Q.8 Solve the following system of Equations by Crammer's Rule

$$X + Y + Z = 6$$

$$X - Y + Z = 2$$

$$2X + Y - Z = 1$$

Q.9 If  $A = \begin{vmatrix} 1 & 3 & 2 \\ 2 & 0 & 3 \\ 1 & -1 & 1 \end{vmatrix}$

Then evaluate  $2A^2 - A - I$

**Unit - V**

Q.10 Solve the Congruence equation  
 $33X = 38 \pmod{280}$

Q.11 Prove the proposition  $P$  that sum of the squares of the first  $n$  positive integers is-

$$\frac{n(n+1)(2n+1)}{6}$$

$$\text{i.e. } P(n) : 1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

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**Part - C**

- Q.12 In a class of 80 students, 50 students know English, 55 know French and 46 know German Languages. 37 knows English and French, 28 knows French and German. 7 students know none of the languages find out-
- How many students know at least one language.
  - How many students know all three languages
  - How many knows exactly 2 languages.
  - How many know only 1 language.

Q.13 Check the validity of Following.

(i)  $P, p \rightarrow q \vdash q$

(ii)  $P \rightarrow q, q \vdash p$

Q.14 Solve the following system using augmented matrix (Gauss Elimination)

$$\begin{aligned} X + 2Y + Z &= 3 \\ 2X + 5Y - Z &= -4 \\ 3X - 2Y - Z &= 5 \end{aligned}$$

Q.15 A student is to answer 10 out of 13 questions on an exam.

- How many choices has he
- How many if he must answer the first two questions
- How many if he must answer first or second but not both
- How many if he must answer exactly three out of first five questions
- How many if he must answer at least three of the first five questions

Q.16 Let  $a = 37$  and  $b = 249$

- Find  $d = \gcd(a, b)$
- Find integers  $x$  and  $y$  such that  $d = xa + yb$
- Find  $\text{lcm}(a, b)$

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