

6254

M.Sc. (IT) IST SEMESTER EXAMINATION, 2019

Paper – IV

DISCRETE MATHEMATICS

Time: Three Hours

Maximum Marks: 80

PART – A (खण्ड – अ)

[Marks: 20]

Answer all questions (50 words each).

All questions carry equal marks.

सभी प्रश्न अनिवार्य हैं। प्रत्येक प्रश्न का उत्तर 50 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

PART – B (खण्ड – ब)

[Marks: 40]

Answer five questions (250 words each).

Selecting one 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।

PART – C (खण्ड – स)

[Marks: 20]

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।

PART – A

- Q.1 (i) What is Discrete Mathematics? [2]
- (ii) What is sets in Discrete Mathematics? [2]
- (iii) What is Cardinality of a set? [2]
- (iv) What is Propositional logic? [2]
- (v) What are Tautologies? [2]
- (vi) Define Contradictions. [2]
- (vii) What is Square matrices? [2]
- (viii) What is mutually exclusive events in probability? [2]
- (ix) Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed? [2]
- (x) Define Congruence relation. [2]

PART – B

UNIT –I

- Q.2 In a group of 100 persons, 72 people can speak English and 43 can speak French. How many can speak English only? How many can speak French only and how many can speak both English and French? [8]

OR

Write short notes on – [2+4+2]

- (i) Power sets
- (ii) Types of relations
- (iii) Empty and subset

UNIT –II

Q.3 Write a note on exponential and logarithmic functions. [8]

OR

Explain logical equivalence and logical implications. [8]

UNIT –III

Q.4 Find the inverse of Matrix- [8]

$$\begin{bmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{bmatrix}$$

OR

Solve the system of linear equations given by Gaussian elimination method- [8]

$$3x - 2y + 8z = 9$$

$$-2x + 2y + z = 3$$

$$x + 2y - 3z = 8$$

UNIT –IV

Q.5 In how many different ways can the letters of the word ‘MATHEMATICS’ be arranged such that the vowels must always come together? [8]

OR

Write short notes on – [4+4]

- (i) Binomial distribution
- (ii) Inclusion – exclusion principle

UNIT –V

Q.6 Discuss the Euclidean algorithm. [8]

OR

Prove that (by mathematical induction) – [8]

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6} \text{ for all positive integer } n.$$

PART – C

Q.7 Write short notes on – [4+6]

- (i) Closure properties
- (ii) Set operations

Q.8 Explain the followings - [4+4+2]

- (i) Recursively defined functions
- (ii) Conditional and bi-conditional statements
- (iii) Invertible functions

Q.9 (a) Verify that $A^2 = I$ when $A = \begin{bmatrix} 0 & 1 & 1 \\ 4 & 3 & 4 \\ 3 & 3 & 4 \end{bmatrix}$ [5+5]

(b) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 3 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$ verify-

- (i) $(AB)C = A(BC)$
- (ii) $A(B + C) = AB + AC$

Q.10 (a) Explain Pigeon – hole principle with example. [5+5]

(b) Discuss conditional probability.

Q.11 Write short notes on – [4+4+2]

- (i) Division Algorithm
 - (ii) Fundamental theorem of arithmetic
 - (iii) Order and inequalities
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