

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT
(An Autonomous Institute U/s UGC Act 1956)

IMSc-IT SEMESTER-II, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1BS202

DATE: 05-01-2026

SUBJECT NAME: DISCRETE MATHEMATICS

TIME: 11:00 AM to 02:00 PM

TOTAL MARKS: 70

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Write answers of **Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Bloom's Taxonomy Levels (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

Marks BL CO

Q.1 Multiple-Choice Questions

[05]

- (a) A relation that is reflexive, symmetric and transitive is called____. 1 U 2
- (i) binary relation (ii) inverse relation
- (iii) equivalence relation (iv) None of these
- (b) Let $A=\{1,2,3,4,5\}$ and $B=\{1,2,4,6,7\}$, the relation from A to B defined by 1 U 2
- (i) greater than (ii) less than
- (iii) less than equal to (iv) greater than equal to
- (c) A relation that is reflexive, antisymmetric and transitive is called____. 1 U 4
- (i) Hasse diagram (ii) total order set
- (iii) partial order set (iv) None of these
- (d) A proposition which is always true is called____. 1 R 3
- (i) contradiction (ii) biconditional
- (iii) tautology (iv) None of these

- (e) If 10 pigeons are placed into 9 pigeonholes, at least how many pigeonholes must contain more than one pigeon? 1 R 3
- (i) 0 (ii) 11
- (iii) 1 (iv) 10

Q.2 Attempt Any Two [10]

- (a) Show that the relation $x \equiv y \pmod{5}$ defined on the set of integers \mathbf{I} is an equivalence relation 5 A 2
- (b) Let \mathbf{N} be the set of all natural numbers. \mathbf{R} be the relation in \mathbf{N} defined by xRy if and only if $3x+2y=12$. Examine the relation for reflexive, symmetric and transitive 5 A 2
- (c) For a relation \mathbf{R} on set $\mathbf{A}=\{1,2,3,4,5\}$ given by $\mathbf{R}=\{(1,3),(1,2),(2,2),(3,4)\}$ find reflexive closure, symmetric closure, transitive closure 5 A 2

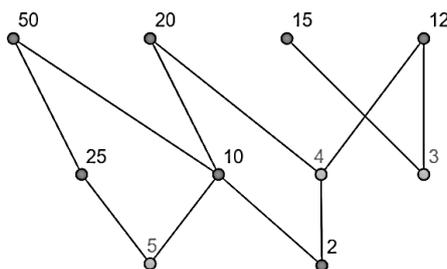
Q.3 Attempt Any Two [10]

- (a) Define logical equivalence and show that $p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$. 5 A 3
- (b) Find principal disjunctive normal form of $q \vee (p \vee \sim q)$. 5 A 3
- (c) State and prove De Morgan's Law by using truth table. 5 A 3

Q.4 Attempt Any Two [10]

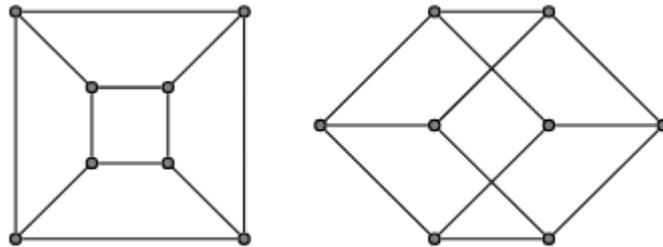
- (a) Draw Hasse diagram of $(P(S), \subseteq)$ for $S=\{a,b,c\}$, where $P(S)$ is the power set of the finite set S and \subseteq be an inclusion relation on the elements of $P(S)$. 5 A 4
- (b) Show that the set of all divisors of 70 forms a Lattice and find the complements of all elements. 5 A 4
- (c) Define the following terms: 5 R 4
- a. Maximal Element
 - b. Minimal Element
 - c. Greatest Element
 - d. Least Element

Also, Find maximal, minimal, greatest and least element for the following Hasse diagram



(b) How many vertices are necessary to construct a graph with exactly 6 edges in which each vertex is of degree 2. 5 A 5

(c) Define Isomorphism of graphs. Check whether the following graphs are isomorphic or not? 5 A 5



Q.8 Attempt Any Two

[10]

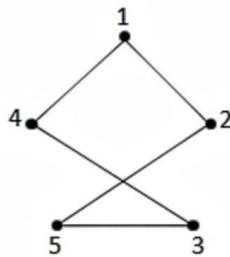
(a) Define the following term:

5 R 5

- a. Walk c. Path e. Circuit
- b. Trail d. Cycle

(b) Find adjacency matrix of the following graph:

5 A 5



(c) Define tree traversal. Write preorder, inorder and postorder traversal for the following tree. 5 A 5

