

2005 JAWAHARLAL NEHRU TECHNOLOGY UNIVERSITY

II B.TECH I SEMESTER SUPPLYMENTARY EXAMINATIONS

DISCRETE STRUCTURE & GRAPH THEORY
(COMPUTER SCIENCE ENGINEERING & IT)

MAY 2005

TIME: 3 HOUR
MARK: 80

ANSWER ANY FIVE QUESTIONS ALL QUESTIONS CARRY EQUAL MARKS

MARK [5*16=80]

1. (a) Explain the Rules of inference.
- (b) Demonstrate that "R" is a valid inference from the premises P! Q, Q! R, and P.
2. (a) Prove that the relation "congruence modulo m " given by $\equiv = \{ \langle x, y \rangle / x - y \text{ is divisible by } m \}$ over the set of positive integers is an equivalence relation.
- (b) Let A be given finite set and $\mathcal{P}(A)$ its power set. Let \subseteq be the inclusion relation on the elements of $\mathcal{P}(A)$. Draw Hasse diagram of $\langle \mathcal{P}(A), \subseteq \rangle$ for
 - i. $A = \{a\}$
 - ii. $A = \{a, b\}$
 - iii. $A = \{a, b, c, d\}$
3. (a) If $f : X \rightarrow Y$ and $g : Y \rightarrow Z$ and both f and g are onto; show that $g \circ f$ is also onto. Is $g \circ f$ one to one if both g and f are one to one? Justify.
- (b) Let $D(x)$ denote the number of divisions of x. Show that $D(x)$ is primitive recursive.
4. (a) Are the graphs given below isomorphic ? {As shown in the figure1}
- (b) Define isomorphism and give examples.
5. (a) Show that the following graph is Eulerian as shown in the figure2.
- (b) Verify the following graph is not Eulerian as shown in the figure3.
- (c) Prove that the complete bipartite graph $K_{2,3}$ is semi-Eulerian
6. (a) Write the algorithm for in order tree traversal . Give an example situation.
- (b) What are the areas of applications, where in order tree traversal can be implemented? Give at least four example situations.
7. (a) Explain the terms
 - i. Disjunctive counting and
 - ii. Sequential counting.
- (b) How many numbers can be formed using the digits 1, 3, 4, 5, 6, 8, and 9 if no repetitions are allowed?
8. Solve the recurrence relation $a_n - 8a_{n-1} + 21a_{n-2} - 18a_{n-3} = 0$ for $n \geq 3$.