Discrete Structures-2025: Quiz-2

Method of Proofs

Full Marks: 20
Time: 40 minutes

September 15, 2025

(1) For each of the following statements, first express them using predicates, quantifiers, and logical connectives. Subsequently, write whether the statement is true or false.

(i) For every integer x, $x^3 \geq x$.

(ii) For all integers x, y, if $x > y$, then $x^2 > y^2$.

(iii) For all natural numbers x, if there exists a natural number y such that $x = y^2$, then $x \geq y$.

(**2 Marks + 2 Marks + 2 Marks**)

(2) **Prove that:** For every positive integer n, n^2 is even if and only if $3n + 4$ is even. (**8 Marks**)

(3) **Prove that:** For every positive integer n, $9^n + 3$ is divisible by 4. (**6 Marks**)