Test Title: Real Numbers
Class: 9B
Description: This test assesses advanced understanding of real numbers, including rational and irrational numbers, operations, properties, and decimal expansions.
Due Date: 27-04-2025
Instructions: Answer all questions. Show all working for short-answer questions. Objective questions should have only one correct answer.

Question 1 (Objective)
Which of the following statements is true about real numbers?
A) Every rational number is an integer.
B) The sum of a rational and an irrational number is always rational.
C) The product of a non-zero rational number and an irrational number is always irrational.
D) All real numbers can be expressed as terminating decimals.

Question 2 (Objective)
Identify the irrational number from the options below:
A) $\sqrt{16}$
B) $0.333...$
C) $0.10100100010000...$ (non-repeating, non-terminating)
D) $\frac{22}{7}$

Question 3 (Short Answer)
Prove that $\sqrt{3}$ is irrational. Provide a step-by-step proof by contradiction, similar to the classic proof of the irrationality of $\sqrt{2}$[3].

Question 4 (Short Answer)
Given two non-terminating decimals, $0.12112111211112...$ and $0.23233233323333...$, explain why both are irrational numbers, and compare their decimal expansions with that of a recurring non-terminating decimal like $0.333...$[3][5].
