NANYANG TECHNOLOGICAL UNIVERSITY

SEMESTER I EXAMINATION 2013-2014

MH 1200 – Linear Algebra I

December 2013 TIME ALLOWED: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. This examination paper contains **FIVE (5)** questions and comprises **TWO (2)** printed pages.
2. Answer **ALL** questions. The marks for each question are indicated at the beginning of each question.
3. Answer each question beginning on a **FRESH** page of the answer book.
4. This **IS NOT an OPEN BOOK** exam.
5. Candidates are allowed to use calculators.

Question 1. (20 marks)

Let k be a real parameter. Solve the linear system

$$x = 2y = 3z = kx$$

and find for which values of k the solution is unique.

Question 2. (20 marks)

Compute the distance from the point of coordinates $(0, 1) \in \mathbf{R}^2$ to the line $x = y$.

Question 3. (20 marks)

Give example of a 3×3 matrix X with the property that $X^2 \neq 0$ while $X^3 = 0$.

Question 4. (20 marks)

Let A be an invertible 2×2 matrix with entries of the form $a + b\sqrt{3}$ where a, b are rational numbers. Prove that A^{-1} has the same property.

Question 5. (20 marks)

Find the dimension of the vector space of 5×5 matrices A satisfying the equation $A + A^T = I$.

END OF PAPER