MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

University Examinations 2014/2015

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

AND

SECOND YEAR, SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN COMPUTER SCIENCE

SMA/ICS 2211: NUMERICAL LINEAR ALGEBRA

DATE: DECEMBER 2014   **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE (30 MARKS)

a) Given the linear system

$$2x_1 - 6\propto x_2 = 3$$

$$3 \propto x_1 - x_2 = 1.5$$

(i)   Find the value(s) of $\propto$ for which the system has no solution   (3 marks)

(ii)   Find value(s) of $\propto$ for which the system has an infinite number of solutions

                                                                                                        (3 marks)

(iii)   Assuming a unique solution exists for a given $\propto$, find the solution   (2 marks)

b) Solve the system of equations below by matrix inversion method   (10 marks)

$x_1+x_2+x_3=1$

$x_1+2x_2+3x_3=6$

$x_1+3x_2+4x_3=6$

c) Solve by Gaussian elimination method the linear system of equations below   (8 marks)

$x_1 + \frac{1}{2}x_2 + \frac{1}{3}x_3 = 1$

$\frac{1}{2}x_1 + \frac{1}{3}x_2 + \frac{1}{4}x_3 = 0$

$\frac{1}{3}x_1 + \frac{1}{4}x_2 + \frac{1}{5}x_3 = 0$

d) Find the condition for k such that the matrix

$$\begin{bmatrix} 1 & 3 & 4 \\ 3 & k & 6 \\ 1 & 5 & 1 \end{bmatrix} \text{ is invertible}$$
(4 marks)

QUESTION TWO (20 MARKS)

a) Solve by Gauss-Seidel iterative method the equations   (15 marks)

$10x_1+x_2+x_3=12$

$2x_1+10x_2+x_3=13$

$2x_1+2x_2+10x_3=14$

b) Show that if A and B are invertible square matrices of the same order, then AB is also invertible and that $[AB]^{-1} = B^{-1}A^{-1}$ (5 marks)

QUESTION THREE (20 MARKS)

Solve the following linear system of equations by Crout's method

x+y+z=9

2x-3y+4z=13

3x+4y+5z=40

QUESTION FOUR (20 MARKS)

a) Determine the eigen values and corresponding eigen vectors of the following system and show that the eigen vectors are linearly independent. (15 marks)

$$10x_1 + 2x_2 + x_3 = \lambda x_1$$

$$2x_1 + 10x_2 + x_3 = \lambda x_2$$

$$2x_1 + x_2 + 10x_3 = \lambda x_3$$

b) Find the inverse of the matrix below using Gauss-Jordan method (5 marks)

$$\begin{bmatrix} 5 & 6 \\ 1 & 2 \end{bmatrix}$$