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**University Examinations 2015/2016**

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

**SMC 3210: NUMERICAL LINEAR ALGEBRA**

**DATE: November, 2015 TIME: HOURS**

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

**QUESTION ONE – (30 MARKS)**

1. (i) Determine whether the matrix below is singular or non singular.

 (2 Marks)

(ii) What is linear optimization (programming)? (1 Mark)

(iii) What is the sufficient and necessary condition for matrix inversion? (1 Mark)

1. If what is the cofactor of the above matrix? (2 Marks)
2. Solve the following system of equations:

+ = 7

1. Determine the augmented matrix. (1 Mark)
2. Carryout row reduction (2 Marks)
3. Using backward or forward substitution determine the solution of

(3 Marks)

1. If the determinant of the matrix below is -242.83. Determine the value of a

 (3 Marks)

1. Determine the characteristic polynomial, eigen values and eigenvectors of the matrix below.
2. Determine the characteristic polynomial. (1 Mark)
3. Determine the eigenvalues. (2 Marks)
4. Determine the eigenvectors. (3 Marks)
5. Find the inverse of the matrix below using the Gauss-Jordan method.

 (4 Marks)

1. Solve the system of linear equations below by matrix inversion method. (9 Marks)

**QUESTION TWO (20 MARKS)**

Maximize

Subject to

 5x = 4y

(As always x , y )

Using the simplex method.

**QUESTION THREE (20 MARKS)**

Solve the system of the equations below using the Jacobi iteration method.

1. Set up the iteration matrix in the form;

H (4 Marks)

C (2 Marks)

1. Carryout the first iteration, if (4 Marks)
2. Carryout the second iteration. (4 Marks)
3. Carryout the third iteration. (4 Marks)
4. If the exact solution is = and , determine the absolute error.

(2 Marks)

**QUESTION FOUR (20 MARKS)**

Solve the system of the equations below using the Gauss-Siedel method.

 - + =

- 2 =

 0+ =

1. Set up the iteration matrix in the form;

H (4 Marks)

C (2 Marks)

1. Carryout the first iteration, if (4 Marks)
2. Carryout the second iteration. (4 Marks)
3. Carryout the third iteration. (4 Marks)
4. If the exact solution is = 5 and = 3 determine the absolute error(2 Marks)

**QUESTION FIVE (20 MARKS)**

Consider the system of equations below:

 + + =

 +3 - =

 ++ =

1. Set up the decomposition matrix;

A = Lu (uii = 1) (2 Marks)

1. Solve the unknowns in (i) above (5 Marks)
2. Solve the equation Lz = b where b = (3 Marks)
3. Solve the equation where (3 Marks)

b) Confirm your solution for T in (iv) above. Using any suitable method e.g Cramer’s rule.

1. Determinant of the the matrix (1 Mark)
2. Solution of (2 Marks)
3. Solution of (2 Marks)
4. Solution of (2 Marks)