KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: COMP 327

COURSE TITLE: APPLIED NUMERICAL METHODS

STREAM: Y3S2

DAY: TUESDAY

TIME: 9.00 – 11.00 P.M

DATE: 14/12/2010

INSTRUCTIONS:

1. **This question paper has FOUR questions**
2. **QUESTION ONE IS COMPULSORY AND HAS 30 MARKS**
3. **Answer any other TWO questions worth 20 marks each.**

PLEASE TURNOVER

QUESTION ONE (30 marks)

(a) Write a program to calculate the following expression $\sqrt{(1/1+x^2)}$ **(4mks)**

(b) What is the use of tolerance value in computing a problem iteratively **(2mks)**

(c) How does truncation error occur? Give two examples **(3mks)**

(d) State the three steps of determining the eigenvalues and eigenvectors **(3mks)**

(e) With the use of an example explain predominantly diagonal system **(3mks)**

(f) What is the difference between accuracy and precision **(2mks)**

(g) Write an algorithm for solving a problem in Gauss Jordan method **(5mks)**

(h) Write a program to solve root of a number using Newton Raphson method **(6mks)**

(i) Write the predictor and corrector equation used in Euler's method **(2mks)**

QUESTION TWO (20 marks)

(a) Define dominant eigenvalues and dominant eigenvectors **(2mks)**

(b) Write the formula for Regular falsi method and use it to find $\sqrt{5}$ given interval [2, 3] **(6mks)**

(c) Write an algorithm for Gauss elimination method **(4mks)**

(d) Explain transpose of matrix with example **(2mks)**

(e) How do you set convergence criterion of Gauss Seidel Method **(2mks)**

(f) Define following terms giving examples in each

(i) Relative Error

(ii) Absolute error **(4mks)**

QUESTION THREE (20 marks)

(a) What is an error? Explain two sources of error with examples **(5mks)**

(b) Find the positive roots of the equation $\mathbf{x^2-2=0}$ using Newton Raphson method. Start with $x_0=6$. Carry out five iterations **(6mks)**

(c) Name three examples of methods used to solve linear algebra in equation and indicate whether they are direct or iterative. **(3mks)**

(d) Determine the coefficient matrix, augmented matrix and solution matrix using example of three equations of three unknowns **(3mks)**

(e) What are the basic assumptions behind the method of least squares? Explain **(3mks)**

QUESTION FOUR (20 marks)

(a) What is the meaning of nonlinear algebraic equation? **(2mks)**

(b) Find the eigenvalues and eigenvectors of the following 2x2 matrix

8 -4

2 2 **(6mks)**

(c) Derive the sigma notation of Taylor series **(3mks)**

(d) Explain the difference between ordinary differential equation and partial differential equation **(2mks)**

(e) What is the difference between Secant method and Newton Raphson method **(2mks)**

(f) *Gi*ven the following set of points, obtain the table of divided difference. Use the table to estimate the value of $f(1.5)$ **(5mks)**

Xi	*1*	*2*	*3*	*4*	*5*
f(xi)	*0*	*7*	*26*	*63*	*124*