KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: COMP 327

COURSE TITLE: APPLIED NUMERICAL METHODS

STREAM: Y3S2

DAY: TUESDAY

TIME: 9.00 – 11.00 A.M.

DATE: 22/03/2011

INSTRUCTIONS:

1. This paper has two parts: section 'A' and section 'B'.
2. Section 'A' has ONE question which is COMPULSORY and carries 30 marks.
3. Attempt ANY TWO questions section B

PLEASE TURN OVER

SECTION A (30 MARKS)

1. Explain three applications of Numerical methods **(3 marks)**

2. Given the equations

ax+by=c……………….(1)
px+qy=r………………..(2)

solve the equations and write an algorithm to solve the same **(4 marks)**

3. By obtaining a recurrence relation write an algorithm to find the sum of the series given by

4. $\sin x = x - x^3/3! + x^5/5! - x^7/7! + \ldots\ldots\ldots\ldots (-1)^n x^{2n-1}/2n-1! + \ldots$ **(6 marks)**

5. Define the following with an example
   i. Truncation error
   ii. Round-off Error
   iii. Inherent Error

(3 marks)

6. If a function f and its first n+1 derivatives are continuous on an interval containing a and x ,derive Taylor's series formulae

(4 marks)

7. Given a polynomial

$$P(x)=a_0+a_1x+a_2x^2+\ldots\ldots\ldots\ldots a_nx^n$$

write an algorithm to evaluate the polynomial **(5 marks)**

8. Explain the important features of algorithms **(3 marks)**

9. Subtract the following floating-point numbers $\mathbf{0.36143447X10^7}$ and $\mathbf{0.36132346X10^7}$

(2 marks)

SECTION B

Answer any two

Each question carries equal marks

QUESTION TWO.(20 marks)

1. Obtain a second degree polynomial approximation to $\mathbf{f(x) = (1+x)^{1/2}}$**,** Using Taylor series expansion about x=0.Use the expansion to approximate **f (0.05)** and find a bound truncation error.

(6 marks)

2. Given a function f(x) which is real and continuous in an interval **[a,b]** and **f(a)** and **f(b)** are opposite in sign, by satisfying bisection method criteria ,generate the bisection Method Algorithm.

(5 marks)

3. Using successive bisection method solve $\mathbf{x^3-9x+1=0}$ for the root lying between 2 and 3 in six (6) iterations

(6 marks)

4. Find the sum of $\mathbf{0.123X10^3}$ and $\mathbf{0.456X10^2}$ and write the result in three-digit mantissa form

(3 marks)

QUESTION THREE. (20 marks)

1. Given to points x0 and x1 such that f(x0) and f(x1) are opposite in sign generate Regula falsi Algorithm for successive approximation

(5 marks)

2. Find a real root of $\mathbf{x^3-2x-5=0}$ by the method of false position correct to decimal places between 2 and 3

(6 marks)

3. If x0 and x1 are two points such that $f(x_0)$ and $f(x_1)$ are opposite in sign generate the Regula Falsi Algorithm

(5 marks)

4. Derive Runge-Kutta 4^{th} order Formula with respect to Euler's method and Taylor's series

(4 marks)

QUESTION FOUR (20 marks)

1. Using Newton Raphson method and ignoring the higher terms generate the iterative formula for Newton Raphson method

(5 marks)

2. Find by Newtons method the real root of **3x=cosx+1** near **0.6, x** is in Radians correct to three decimal places

(6 marks)

3. Perform four iterations of Newton-Raphson method to find the smallest positive root of the equation **f(x)=x3-5x+1=0**

(4 marks)

4. Given the values

5. x :5x	6. 5	7. 7	8. 11	9. 13	10. 17
11. f(x) :11 f(x)	12. 150	13. 392	14. 1452	15. 2366	16. 5202

Evaluate f(9) using Lagrange's formula

(5 marks)