KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR SCIENCE IN COMPUTER SCIENCE

COURSE CODE: COMP 327

COURSE TITLE: APPLIED NUMERICAL METHODS

STREAM: Y3S2

DAY: MONDAY

TIME: 9.00 – 11.00 A.M.

DATE: 10/08/2009

INSTRUCTIONS:

Answer Question ONE and any other TWO questions

PLEASE TURN OVER

QUESTION-1 (30 MARKS)

1. Write a program in C/C++ to generate the following pattern

   2
   4 6
   8 10 12
   14 16 18 20   (5mks)

2. Write a C/C++ program to find the reverse a given number and the sum of its digits (5mks)

3. Write a C/C++ program to add two 3 by 3 matrices   (7mks)

4. Write a program to implement Simpson's $1/3^{rd}$ rule.   (7mks)

5. Write a program to solve a quadratic equation   (6mks)

QUESTION-2 (20 MARKS)

1. Write a program to find the transpose of a matrix   (8mks)

2. Write a program to find the norm and trace of a matrix   (9mks)

3. Write an algorithm for the gauss elimination method   (3mks)

QUESTION-3 (20 MARKS)

1. Write a C/C++ program to implement the bisection method   (10mks)

   i) Apply three steps of Newton's method to find a better approximation of the
      minimum of the function $f(x) = x^2 - 4x + 2$ starting with the point $x_0 = 3$.   (3mks)

   ii) Write a program for the above N-R method   (7mks)

QUESTION-4 (20 MARKS)

1. Write a program for the Euler's method   (8mks)

2. Write an algorithm for the Heun's method (Runge kutta 2nd order method)   (8mks)

3. Use four steps of Euler's method to approximate the value of $y(0)$ given the

   initial-value problem $y_{(1)}(t) = y(t) - 3$, $y(-2) = 1$.   (4mks)

QUESTION-5 (20 MARKS)

1. Write a program to implement Simpson's 3/8 rule   (8mks)

2. Write a program for the trapezoidal rule   (8mks)

3. Integrate $f(x) = x^3 - 2x - 2$ on the interval [0, 2] using the trapezoid rule and then again

   with one step of Simpson's rule.   (4mks)