KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: **MATH 314**

COURSE TITLE: **NUMERICAL ANALYSIS**

STREAM: **Y3S1**

DAY: **MONDAY**

TIME: **9.00 – 11.00 A.M.**

DATE: **29/11/2010**

INSTRUCTIONS:

1.Question **ONE** is compulsory.

2. Attempt question **ONE** and any other **TWO**

PLEASE TURNOVER

QUESTION ONE (30 MARKS) COMPULSORY

(a) (i) Given that x = 3.141592 and $\bar{x}$ = 3.14, find the relative error in the approximation. **(2 mks)**

(ii) Show that $\Delta^3 y_0 = y_3 - 3y_2 + 3y_1 - y_0$ **(5 mks)**

(b) Using Newton's backward formula, find the polynomial of degree three passing through (3, 6) (4, 24) (5, 60) and (6, 120) **(7 mks)**

(c) Find the value of $\int_1^5 log_{10} x dx,$ taking 8 sub intervals correct to four decimal places by Trapezoidal Rule **(6 mks)**

(d) The following are the measurements **t** made on a curve recorded by the oscillograph representing a change of current **I** due to a change in the conditions of an electric current

t	1.2	2.0	2.5	3.0
I	1.36	0.58	0.34	0.20

Using Lagrange's formula find I at t = 1.6 **(5 mks)**

(e) When a train is moving at 30m/sec steam is shut off and brakes are applied. The speed of the train per second after t seconds is given by

Time (t)	0	5	10	15	20	25	30	35	40
Speed (v)	30	24	19.5	16	13.6	11.7	10.0	8.5	7.0

Using Simpson's $1/3$ rule, determine the distance moved by the train in 40 seconds. **(5 mks)**

QUESTION TWO (20 MARKS)

(a) Using Newton-Raphson method, solve for a root of the equations starting from the initial approximation $x_0 = y_0 = 1,$ $x^3 - 3xy^2 + 1 = 0$ and $3x^2y - y^3 = 0$ **(10 mks)**

(b) Determine $f^1(6)$ from the following table

x	0	2	3	4	7	9
$f(x)$	4	26	58	112	466	922

(Note: intervals are unequal) **(5 mks)**

(c) Given that $y = x^3 + x^2 - 2x + 1.$ Determine the values of y for $0 \le x \le 5$ and from a difference table. Determine the value of y at $x = 6$ by extending the table and verify that the same value is obtained by substitution. **(5 mks)**

QUESTION THREE (20 MARKS)

(a) The population of a town is as follows

Year (x)	1941	1951	1961	1971	1981	1991
Population (y)	20	24	29	36	46	51

Estimate the population increase during the period 1946 to 1976 [Apply Newtons forward and backward formula respectively] **(10 mks)**

(b) Given the following table, find $y(35)$ by using stirling's formula

x	20	30	40	50
y	512	439	346	243

(5 mks)

Find the gradient of the road at the middle point of the elevation above a datum line of seven points of a road which are given below **(10 mks)**

(c)

X	0	300	600	900	1200	1500	1800
y	135	149	157	183	201	205	193

QUESTION FOUR (20 MARKS)

(a) Solve the Equations $x^2 + y - 11 = 0$ and $y^2 + x - 7 = 0$ starting with the initial values $x_0 = 3.5$ and $y_0 = -1.5$. (Perform two iterations) **(4 mks)**

(b) Obtain the value of $f^1(0.04)$ using Bessel's formula given the table below.

x	0.01	0.02	0.03	0.04	0.05	0.06
$f(x)$	0.1023	0.1047	0.1071	0.1096	0.1122	0.1148

Bessels formula: $y^1(x) = {}^1/_h\left[\Delta y_0 + \frac{2u-1}{4}(\Delta^2 y_{-1} + \Delta^2 y_0) + \frac{\left(3u^2 - 3u + {}^1/_2\right)}{6}\Delta^3 y_{-1}\right]$

(10 mks)

QUESTION FIVE (20 MARKS)

(a) Prove $D = 1/2\,({}^{\uparrow}2 + f\sqrt{(1 + f^{\uparrow}2/4)}$ **(2 mks)**

(b) Find the 7th term of the sequence

2 9 28 65 126 217 **(8 mks)**

(c) Find the missing value in the following table

x	0	1	2	3	4
y	1	2	4	-	16

(5 mks)

(d) From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for a policy maturing at age 46. **(5 mks)**

Age (x)	45	50	55	60	65
Premium (y)	114.84	96.16	83.32	74.48	68.48