KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: MATH 314

COURSE TITLE: NUMERICAL ANALYSIS I

STREAM: Y3S1

DAY: FRIDAY

TIME: 9.00 – 11.00 A.M.

DATE: 10/12/2010

INSTRUCTIONS:

- Answer question **ONE** and any other **TWO** Questions

PLEASE TURNOVER

QUESTION ONE (30 MARKS)

a) Explain each of the following
   i) Numerical analysis
   ii) Truncation Error **(2 marks)**

b) Given that $x = 13.2 \pm 0.05, y = 14.3 \pm 0.08, z = 9.2 \pm 0.06,$ find the percentage error in

$$\frac{x^2 y^3}{z^4}$$

(6 marks)

c) Find the parabola of the form $y = ax^2 + bx + c$ passing through the point (0,0),(1,1)and (2,20)

(5 marks)

d) Find the cubic polynomial which interpolates the following data

X	0	1	2	3
F(x)	1	0	2	10

Hence find f(4). **(4 marks)**

e) Using the Simpson's third rule for n=6, evaluate $\int_0^6 \frac{1}{x^2+1} dx$ **(4 marks)**

f) Let $f(x) = x^2 - a.$ show that the Newton-Raphson method leads to the recurrence

$$x_{n+1} = \frac{1}{2}(x_n + \frac{a}{x_n})$$ **(5 marks)**

g) Evaluate $\Delta(xe^x)$ **(3 marks)**

QUESTION TWO (20 MARKS)

a) Define the finite difference operators $E, \Delta, \nabla, \delta, \mu$. Prove that $\Delta = E - 1.$ **(8 marks)**

b) From the table below of half-yearly premium for policies maturing at different ages estimate the premium for policies maturing at age 46 and 63. **(12 marks)**

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

QUESTION THREE (20 MARKS)

a) The table below gives the production cost c(t) in KSh of producing of a certain computer component.

X	1	2	3	4	5	6	7	8	9	10	11
C(x)	0.082	0.312	0.562	0.832	1.122	1.414	1.762	2.112	2.482	2.872	3.282

If c(x) is a polynomial of degree 2 and c(6) is in error, correct the error in this data. Hence determine a polynomial appropriate to approximate data. **(10 marks)**

b) Use Lagrange's formula to fit a polynomial to the data

X: -1 0 2 3

Y: -8 3 1 12. Hence find y(1). **(10 marks)**

QUESTION FOUR (20 MARKS)

a) Use the Newton-divided interpolation formula to find the polynomial that interpolates the following points. f(0)=3, f(2)=27, f(5)=453 f(9)=2757 **(5 marks)**

b) From the following table find the value of x for which f(x) is a maximum, also find the maximum value. **(10 marks)**

X: 60 75 90 105 120

F(x) 28.2 38.2 43.2 40.9 37.7

c) Using Newton-Raphson method, find correct to four decimals the root between 0 and 1of the equation $x^3 - 6x + 4 = 0$. [Take $x_0 = 0.7$] **(5 marks)**

QUESTION FIVE (20 MARKS)

a) Outline the bisection/having method. Hence ysing your outline perform three iterations to estimate a root of $x^3 - 9x + 1 = 0$. [Take (2,3)as your initial interval] **(10 marks)**

b) Estimate using (i) Trapezoidal Rule

(ii) Simpson's third Rule, the value of $\int_0^{1.2} e^{x^2} dx$ using n = 6 to 3d.p

(10 marks)