KENYA METHODIST UNIVERSITY
END OF FIRST TRIMESTER 2007 EXAMINATIONS

FACULTY   :   SCIENCES
DEPARTMENT   :   MATHEMATICS AND COMPUTER SCIENCE
COURSE CODE   :   MATH 320
COURSE TITLE   :   NUMERIC ANALYSIS I
TIME   :   2 HRS

Instructions:
- Answer question 1 and any other 2 questions.

Question 1 (30 marks)

a)   The number 31.546824 is known to have a relative error no worse than one part in 100, 000. How many of the digits are known to be correct?   (5 mks)

b)   Solve the equation $x^3 - 9x^2 + 26x - 24 = 0$ given that the roots are in arithmetic progression.(4 mks)

c)   Find the smallest root of the equation:

$$x - \frac{x^3}{3} + \frac{x^5}{10} - \frac{x^7}{42} + \frac{x^9}{216} - \frac{x^{11}}{1320} \ldots\ldots = 0.4431135$$

by the method of successive approximation   (4 mks)

d)   Construct a forward difference table from the following data:

x	0	1	2	3	4
Y_x	1	1.5	2.2	3.1	4.6

Evaluate $\Delta^3 y_1, y_x$ and y_5 (6 mks)

e)   Find the missing value in the following table:

x	16	18	20	22	24	26
Y	43	89	-	155	268	388

                                                                      (5 mks)

f)   Find the first, second and third derivatives of f(x) at x = 1.5 if

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)	3.375	7.000	13.625	24.000	38.875	59.000

                                                                      (6 mks)

Question 2 (20 marks)

a)   The population of a certain town (as obtained from census data) is shown in the following table.

Year	1951	1961	1971	1981	1991
Population in thousands	19.96	36.65	58.81	77.21	94.61

Find the rate of growth of the population in the year 1981.   (10 mks)

b)   Find a root of the equation $x^3 - x - 11 = 0$ correct to four decimals using bisection method. (10 mks)

Question 3 (20 marks)

a) Represent the function $f(x) = x^4 - 12x^3 + 42x^2 - 30x + 9$ and its successive differences in factorial notation in which the interval of differencing is one. (10 mks)

b) Find the conditions in which the roots of $ax^3 + bx^2 + cx + d = o$ where $a \neq 0$, are in
   i) arithmetic progression (5 mks)
   ii) geometrical progression (5 mks)

Question 4 (20 marks)

a) Use Lagrange's interpolation formula to find the value of y when x = 10, if the values of x and y are given as below:

x	5	6	9	11
Y	12	13	14	16

b) The amount A of a substance remaining in a reacting system after an interval of time t in a certain chemical experiment is tabulated below:

t (min)	2	5	8	11
A (gm)	94.8	87.9	81.3	75.1

Obtain the value of A where t = 9 using Newton's backward interpolation formula. (12 mks)

Question 5 (20 marks)

a) The following are data from the steam table:

Temp ^{o}C (t)	140	150	160	170	180
Pressure Kgf/cm^2 (P)	3.685	4.854	6.302	8.076	10.225

Using Newton's formula, find the pressure of the steam for temperatures 142° and 175°. (8 mks)

b) Evaluate $\displaystyle\int_0^{10} \frac{dx}{1+x^2}$ by using

   i) Trapezoidal rule (4 mks)
   ii) Simpson's ⅓ rule (4 mks)
   iii) Simpson's $\frac{3}{8}$ rule (4 mks)