The Open University of Sri Lanka
B.Sc/B.Ed Degree Programme
Open Book Test (OBT)- 2010/2011
Level 04- Applied Mathematics
AMU2185/AME4185 – Numerical Analysis I

Duration :- One and half hours

Date:- 07.04.2011 **Time:- 4.00p.m.-5.30p.m.**

Answer **ALL** the questions

1. (a) Why numerical methods are necessary to solve some problems?

(b) Show by graphical method that the equation $\cos x - \log_e x = 0$ has a unique solution in the range $\left[1, \frac{\pi}{2}\right]$.

(c) Tabulate the values of $\cos x$ and $\log_e x$ and obtain the numerical solution of above equation correct to 3 decimal places.

2. (a) Explain what are meant by the terms

(i) Fundamental error

(ii) Rounding error

(iii) Absolute error

(b) The function q is defined as $q = \frac{x}{y}$. If $x = 4.536$ and $y = 1.32$, find the value of q (correct to the appropriate decimal place). Also find the relative error in the result.

(c) Let the sum $S = a + b$. Show that $|r_S| \leq \left|\frac{a}{S}\right| |r_a| + \left|\frac{b}{S}\right| |r_b|$, where r_S, r_a and r_b are the relative errors in S, a and b respectively.

3. (a) (i) Show that the equation $f(x) = x^3 - x - 4 = 0$ has a root in the interval $[1,2]$.

(ii) Using the bisection method find the root of $f(x)$ defined in part (i) correct to 3 decimal places.

(b) A root of the equation $2x - \log_{10} x = 7$ lies between 3.5 and 4.0. Using the method of false position, find this root correct to five decimal places.

The Open University of Sri Lanka
B.Sc/B.Ed Degree Programme
Closed Book Test (CBT)- 2010/2011
Level 04- Applied Mathematics
AMU2185/AME4185 – Numerical Analysis I

Duration :- One and half hours

Date:- 02.05.2011 **Time:- 4.00p.m.-5.30p.m.**

Answer ALL the questions

1. (a) What is the geometric interpretation of the Newton's formula for solving $f(x)=0$.

   (b) Use the Newton's method to find $\sqrt[3]{788}$ correct to 4 decimal places. Assume that $x_0 = 7.0$.

2. (a) Derive Horner's scheme for division of a monic n^{th}-degree polynomial $f(x) = x^n + a_1 x^{n-1} + \cdots + a_{n-1}x + a_n$ by a factor $(x-\alpha)$.

   (b) Use the Horner's scheme to find all roots of $x^3 + x^2 + 12x - 24 = 0$. All roots should be correct up to 4 decimal places (in case of any complex roots, each part to that decimal place).

3. (a) Explain how the Lagrange interpolation polynomial $p(x)$ is found for the data set $(x_0, y_0), (x_1, y_1), \ldots, (x_n, y_n)$.

   (b) Use Lagrange's method to find $\ln 2.3$ from the table.

x	2.0	2.5	3.0
$\ln x$	0.69315	0.91629	1.09861

How accurate is your result.