



The Open University of Sri Lanka  
B.Sc. Degree Programme - Level 05  
Open Book Test-2016/2017  
APU3240/APE5240 — Numerical Methods

Duration: One and Half (1 ½) Hours

Date: 30. 04. 2017

Time: 10.30 a.m. –12.00 noon

**ANSWER ALL QUESTIONS.**

1. (a) Find the root of the equation  $x^3 - x - 1 = 0$  lying in the interval  $[1, 2]$ , correct to 3 decimal places using bisection method.  
(b) Show that the equation  $e^x + x - 2 = 0$ , has a root in the interval  $[0, 1]$ . Determine the root correct to 4 decimal places taking  $x_0 = 0.4$ , using Newton -Raphson method.  
(c) Find the maximum number of iterations required to find the root in the interval  $[1, 2]$  of the equation  $x^3 + 4x^2 - 10 = 0$  correct to 4 decimal places using iterative method.
2. (a) State Newton- Gregory backward interpolating polynomial. Hence, find  $e^{2.00}$  corresponding to the data points  $(0.1, 1.1052)$ ,  $(0.6, 1.8221)$ ,  $(1.1, 3.0042)$ ,  $(1.6, 4.9530)$  and  $(2.1, 8.1662)$ .  
(b) State Stirling's interpolating polynomial. Hence, find  $e^{1.3}$  corresponding to the data points given in part (a).
3. (a) State Newton's divided difference formula. Hence, find the polynomial of degree four, passing through the points  $(1.0, 0.7651977)$ ,  $(1.3, 0.6200860)$ ,  $(1.6, 0.4554022)$ ,  $(1.9, 0.2818186)$  and  $(2.2, 0.110362)$ .  
(b) Write down an expression to find derivative of a point using Newton- Gregory forward interpolating formula. Using the values given in the following table find the value of  $\sec 31^\circ$ .

$\theta^\circ$	$31^\circ$	$32^\circ$	$33^\circ$	$34^\circ$
$\tan \theta^\circ$	0.6008	0.6249	0.6494	0.6745