

W1-2-60-1-6

**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2013/2014**

**EXAMINATION FOR THE DEGREE OF BACHELOR OF ELECTRICAL AND ELECTRONIC ENGINEERING, CIVIL ENGINEERING, TELECOMMUNICATION ENGINEERING AND MECHANICAL ENGINEERING**

**SMA 2471: NUMERICAL ANALYSIS**

**DATE: DECEMBER 2013 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS.**

**QUESTION ONE (20 MARKS)**

1. Solve  using Euler’s modified method for x=0.02 taking

h=0.01 [5 marks]

1. Use Newton – Raphson method to find the real root of x4-11x + 8 = 0 near x0 = 2

Accurate to five decimal point. [6 marks]

1. A slider in a machine moves along a fixed rod. Its distance x(m) along the rod are given in the following table for various valves of the time t(seconds)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| T(Sec) | 1 | 2 | 3 | 4 | 5 | 6 |
| X(m) | 0.0201 | 0.0844 | 0.3444 | 1.0100 | 2.3660 | 4.7719 |

Use Newton’s backward interpolation formula to find velocity and acceleration of the slider at t= 6 seconds. [7 marks]

1. Find the form of the function f(x) hence use Your polynomial to estimate the valve f(3) by lagrange interpolation technique

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | 0 | 1 | 2 | 5 |
| F(x) | 2 | 3 | 12 | 147 |

[7 marks]

1. Use trapezoidal role to find the error incurred in approximating;

 dx with 8 strips [4 marks]

**QUESTION TWO (20 MARKS)**

1. Give the table

|  |  |  |  |
| --- | --- | --- | --- |
| i | 0 | 1 | 3 |
| xi | 2 | 2.5 | 4 |
| f(xi) | ½ | ½.5 | ¼ |

Construct the lagrange interpolating polynomial for the table and use it to approximate f(3). Evaluate the maximum error for this interpolation. [7 marks]

1. Use Newton’s forward difference formula of degree four for values x=0(1)4 to approximate f(x) = ex at x = 1.5. [ 7 marks]
2. Evaluate  Inxdx with n = 2 and 4. Using the Romberg integration formula with trapezium rule. [6 marks]

**QUESTION THREE**

1. Use the AB predictor  and the AM corrector

 to evaluate y(1) to 5 d.p. using 10 steps given



Taylor series may be used to obtain the starting values. [14 marks]

1. Compute the analytical solution. What is the percentage error involved in the numerical methods in (a) above? [6 marks]

**QUESTION FOUR (20 MARKS)**

1. Evaluate  by Ganss- legendre two point and three point integration rules. [10 marks]
2. Use Runge-Kutta method of fourth order with h=0.2 to find y(0.2) and y(0.4) given

 [10 marks]