**BRAC UNIVERSITY**

**Department of Computer Science and Engineering**

**CSE330: Numerical Methods  
Final Exam, Fall 2014**

**Duration: 2 hours and 30 minutes, Total Marks: 100**

**THERE ARE EIGHT (8) QUESTIONS. ANSWER ANY FIVE (5)**

1. (a) Suppose you are given *(x1,y1), (x2,y2), (x3,y3)…..….. (xn,yn)* data points, derive the coefficients *a0* and *a1* of linear regression formula y=*a0*+*a1*x [10]

(b) Find the value of the constants *a0* and *a1* of the linear regression model y=*a0*+*a1*x considering below Table 1. [7+3]

Table 1

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **V1** | **V2** |
| 1 | 3.5 | 4.9 |
| 2 | 4.1 | 5.2 |
| 3 | 4.9 | 6.4 |
| 4 | 5.3 | 7.4 |
| 5 | 6 | 8.1 |

1. (a) Assume that you are given . Find central difference approximation of the first derivative of *f(x)* using step size=0.2 and 0.4 when the point of differentiation is x=2. Also find the absolute relative true error for both cases. [8+2]

(b) Let *f(x) =*, numerically approximate the integral using Simpson’s 3/8 rule with *n=6.* Also find the absolute relative true error. [8+2]

1. (a) Using Runge-Khutta 4th order method solve the ODE given below. Find the value of y at t=0.5 and step size of 0.5

[10]

(b) Using Euler’s method find the value of y at x=0.2 for the following ODE with step size=0.1 and 0.05. [10]

1. (a) Derive the 2nd order polynomial using Lagrangian interpolation formula. [10]

(b) Using the data of Table 1, find the change of V2 between V1=4.1 and V1=5.2 applying second order Newton’s divided difference. [7+3]

1. (a) Drive formula for Secant method for finding root(s) of a non-linear equation. Why would you use Secant method instead of Newton-Raphson method for finding root(s) of a non-linear equation? [7+3]

(b) Use Secant method to estimate the root of with initial estimates *x-1*=0.3 and x0=0.35. Show your result along with the percentage errors in tabular form for first three iterations. [7+3]

1. (a) Discuss the limitations of Newton Raphson’s Method of solving a root of a nonlinear equation? [10]

(b) Use false position method to find the root(s) of with *xl=0* and *xu = 1.1.* Show your results along with the percentage errors for first three iterations in a tabular form. [10]

1. Using LU decomposition method find the inverse of the matrix given below:

[20]

1. (a) From Tailor series, derive the approximate central difference formula for second order differentiation of a function. [10]

(b) With the help of Trapezoidal rule of Integration, integrate using single segment. Show, in a tabular form, the effect step size on the value of the integration considering step size=1, 2 and 4. In the table, show the values of integration and percentage true error against the value of ‘n’. [5+5]

**GOOD LUCK**