**BRAC UNIVERSITY**

**Department of Computer Science and Engineering**

**CSE330: Numerical Methods  
Final Exam, Spring 2015**

**Duration: 2.30 hours, Total Marks: 80**

**THERE ARE SIX (6) QUESTIONS. ANSWER ANY FOUR (4)**

1. (a) Using Gauss elimination method solve the below system: [10]

(b) Derive the formula of central difference approximation using Taylor series. [10]

1. (a) Derive Newton- Raphson’s formula using graphical method. Write an algorithm for Newton-Raphson’s method. [4+6]

(b) Let ***f(x) =***, numerically approximate the integral using Simpson’s 1/3 rule with ***n=6****.* Also find the absolute relative true error. [8+2]

1. (a) Using Table 1, find the regression coefficient **a0** and **a1** using linear regression method. [10]

**Table 1**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **V1** | **V2** |
| 1 | 1.2 | 2.3 |
| 2 | 1.5 | 2.8 |
| 3 | 1.9 | 3.4 |
| 4 | 2.3 | 3.9 |
| 5 | 2.9 | 4.3 |
| 6 | 3.4 | 5.6 |

(b) Find the root of the below equation using secant method with initial value **x-1=0.3** and **x0=0.9**. Do your calculation for first three iterations and show you results in a tabular form with all the percentage errors. [10]

1. (a) Let’s assume you are riding bicycle on your way to home from university. Distance you covered between t=4 and t=16 is given by the below equation: [6+2+2]

1. Use **n** segments trapezoidal rule to find the distance covered. Use **n**=**1, 3**.
2. Find true error,
3. Find true error,

(b) Derive the formula for second order Newton’s divided difference polynomial method. [10]

1. (a) Draw a flow chart to find the root(s) of a nonlinear equation using false position method. [8]

(b) Using Table 1, form a matrix representation for finding the values of the coefficients for the polynomials having quadratic Splines. [12]

1. (a) Table 2 shows increase of temperature of an object when applied heat. As you can see that from the given data it is hard to know the temperature of the object at any random moment within that range. So your job is to use Lagrange interpolating polynomial to find the value of Θ at any random time within the range in Table 2. For this problem assume **T=23.9** sec. and use third order Lagrange interpolation polynomial method. [10]

**Table 2**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **T, Sec** | **Θ0 C** |
| 1 | 10 | 50 |
| 2 | 15 | 61 |
| 3 | 20 | 70 |
| 4 | 23.5 | 79 |
| 5 | 27.6 | 83 |

(b) Using Euler method solve the initial value problem,. Find the approximate solution at using step size, . [10]

**GOOD LUCK**

1. (a) Apply **LU** decomposition method to find the inverse of the given matrix: [13]

(b) Use bi-section method to find the root(s) of with ***xl=0*** and ***xu = -0.8****.* Show your results along with the percentage errors for first three iterations in a tabular form.[7]

1. (a) Let’s assume the area under the cureve is given by Use multiple- segment trapezoidal rule to find the area under the curve. Use and Also show the absolute relative error. **[8+2]**