**BRAC UNIVERSITY**

**Department of Computer Science and Engineering**

**CSE330: Numerical Methods  
Midterm Exam, Spring 2014**

**Duration: 1 hour, Total Marks: 45**

**Set: A**

**ANSWER ANY 3 (THREE)**

1. (a) What is true error and relative true error? [5]

(b) Derive Newton-Raphson formula. Write down the algorithm for Newton-Raphson

method. [10]

1. (a) Derive the matrix formulation for obtaining the coefficients for non-linear regression. [7]

(b) Find a root of the non-linear equation given below. Use bisection method and continue your solution up to 3rd iteration. Show your results in a tabular form including the percentage errors. Assume the stating value of the root as xl= 0.4 and xu=1.3. [8]

*f(x) = ex –3x*

1. (a) Using Table 1. form a matrix representation for solving the coefficients for the polynomials having splines. [8]

Table 1

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **V1** | **V2** |
| 1 | 110 | 75 |
| 2 | 165 | 81 |
| 3 | 201 | 96 |
| 4 | 234 | 101 |

(b) Draw the flow chart of false position method for finding roots of a non-linear equation. [7]

1. (a) Assume that you started an iterative process to find root(s) of a polynomial. How do you find the largest root and root interval for that polynomial? What are the iteration stopping criterions? Give your answer considering the below polynomial. [7]



(b) Using Table 1, find the value of V2 at V1=172 using third order Lagrangian polynomial interpolation. Also find the change of V2 between V1=160 and V1=178 using third order Lagrangian polynomial interpolation. [8]

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**Set: B**

**ANSWER ANY 3 (THREE)**

1. Find the root of the non-linear equation using Newton Raphson’s Method. Continue your solution up to 3rd iteration. Show your results in a tabular form including the percentage errors. [8]

(b) Find a linear regression curve through the points given in the below table 1. Calculate also the total error square (ε2) for your curve. [7]

Table 1

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **V1** | **V2** |
| 1 | 10 | 8 |
| 2 | 12 | 10 |
| 3 | 15 | 12 |
| 4 | 17 | 15 |
| 5 | 19 | 17 |

1. (a) Draw the flow chart of Bisection method for finding root of a non-linear equation. [8]

(b) Find a root of the non-linear equation given below. Use Secant method and continue your solution up to 3rd iteration. Show your results in a tabular form including the percentage errors. Assume the stating value of the root as -1.2 and -0.5. [7]

***f(x) = 3 - 7.5sinx***

1. (a) Using Table 1, determine the value of V2 at V1=13 with third order polynomial interpolation using Newton’s divided difference polynomial method. Also find the change of V2 between V1=13 and V1=16. [8]

(b) Assume you are given *(n+1)* data points, draw the flow chart of **Langrange Method** for finding the interpolating polynomial**.** [7]

1. (a) Derive the matrix formulation for obtaining the coefficients for non-linear regression. [7]

(b) Find a root of the non-linear equation given below. Use Secant method and continue your solution up to 3rd iteration. Show your results in a tabular form including the percentage errors. Assume the stating value of the root as -1.2 and -0.5. [8]

***f(x) = ex -x***

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**ANSWER ANY 3 (THREE)**

1. (a) Find the root of the non-linear equation given below using Newton Raphson’s Method. Continue your solution up to 3rd iteration. Show your results in a tabular form including the percentage errors. First approximation, *x0*= -2. [7]

(b) Write down the algorithm for false position theorem. [8]

1. (a) Find the root of the non-linear equation given below using secant method. Continue your steps up to 3rd iteration. Show your results in tabular form including percentage errors. Use *x-1 = 1.2*  and *x0=2.3.* [8]

(b) Assume you are given *(n+1)* data points, draw the flow chart of Langrange Methodfor finding the interpolating polynomial that goes through these *(n+1)* data points**. [7]**

1. (a) Using Table 1, form a matrix representation for solving the coefficients for the polynomials having quadratic splines. [10]

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **V1** | **V2** |
| 1 | 10 | 20 |
| 2 | 12 | 23 |
| 3 | 15 | 27 |
| 4 | 17 | 34 |
| 5 | 19 | 37 |

(b) Write down the advantages and scopes of Numerical methods. [5]

1. (a) Suppose you are given *(x0,y0),(x1,y1),(x2,y2).....(xn,yn)* data points, derive the linier regression formula to find the value of the coefficients. [7]

(b) Using Table 1, find the value of V2 for V1(16) using third order Newton’s divided [8] difference polynomial method. Also find the change of V2 between V1(11) and V1(16).