

B.E Food Technology & Biochemical Engineering 2nd Year 2nd Semester Examination 2018
Numerical Methods and Computer Programming
Answer all questions

Time: 3 hours

Full Marks: 100

1) Derive the formula for Newton-Raphson method. Discuss about its convergence. Apply the Method to find the square root of 7 corrected up to 3 decimal places.

OR

Graphically illustrate Fixed Point Iteration and its convergence. Rewrite the equation $x^3 - x - 1 = 0$ in the form $x = g(x)$ such that choice of $g(x)$ follows the condition for convergence of the said method in (1,2). Apply the method to find the root of the equation corrected up to 2 decimal places.

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2) For n variable simultaneous linear equations, write the form of the i^{th} equation. How would you express the value of the variable x_i under back substitution.

Solve the following simultaneous equations using Gaussian Elimination:

$$x_0 + x_1 + x_2 + x_3 = 1$$

$$4x_0 + 2x_1 + 3x_2 + 4x_3 = 3$$

$$2x_0 + 4x_1 + 5x_2 + 4x_3 = 5$$

$$x_0 + 2x_1 + 2x_2 + 2x_3 = 1$$

4+10

3(a) Using Trapezoidal rule, find $\int_0^1 \sqrt{x^2 + 1} \, dx$. Use a step-size of 0.2.

(b) Using Modified Euler's Method, find $y(0.05)$ for $\frac{dy}{dx} = x - y^2$, $y(0) = 1$. Take $h = 0.025$

7+7

4. Obtain the Lagrange's Interpolating polynomial y from the following data.

x	0	1	3	4
y	5	6	50	105

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5(a). Write a C program to read the coordinates (x, y) of a point on X-Y plane as input and display a message indicating on which quadrant the point lies.

(b) Write a C program to find the sum of $1+11+111+1111+ \dots$ n terms

6+9

6(a) Write a C program to sort a list integers in ascending order of values.

(b) A square matrix a is called symmetric if $a_{ij}=a_{ji}$ for all i and j . For example, following is a 3x3 symmetric matrix:

$$\begin{bmatrix} 1 & 2 & 5 \\ 2 & 5 & -7 \\ 5 & -7 & 3 \end{bmatrix}$$

The following is not a symmetric matrix as $a_{13} \neq a_{31}$

$$\begin{bmatrix} 1 & 2 & 5 \\ 2 & 5 & -7 \\ 8 & -7 & 3 \end{bmatrix}$$

Write a C program to read a 3x3 matrix of integers as input and check if the matrix is symmetric.

10+10

7) Write a C program that reads an integer code between 1 to 3 and computes the volume of one of the following solids as per the following integer code supplied by the user.

CODE	SOLID	FORMULA FOR VOLUME
1	Sphere	$\frac{4}{3}\pi r^3$
2	Rectangular Parallelepiped	$a.b.c$
3	Right Circular Cylinder	$\pi r^2 h$

The program generates an error message on receiving an invalid code as input. Write separate user defined functions for computing the volume of each of the three solids.

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