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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech (Chemical Engg) (Sem.-5)

NUMERICAL METHOD

Subject Code : BTCH-501

M.Code : 70521

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**1. Write briefly :**

- a) Differentiate between 'Interpolation' and 'Extrapolation'.
- b) Define various types of errors in numerical computations.
- c) Write the Simpson's 3/8 rule.
- d) Define significant digits. How many significant digits are there in 1.001?
- e) Write any disadvantage of Newton-Raphson method.
- f) Define algebraic equations and transcendental equations with example.
- g) Define forward operator Δ and shift operator E . Hence prove that $E = 1 + \Delta$.
- h) Define eigen values and eigen vectors of a matrix.
- i) Write the Lagrange's interpolation formula.
- j) Write iterative methods to solve linear algebraic equations.

SECTION-B

2. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Trapezoidal rule and Simpson's 1/3 rule taking $h = 1$.

3. Solve the following system of equations by using the relaxation method :

$$12x + y + z = 31$$

$$2x + 8y - z = 24$$

$$3x + 4y + 10z = 58.$$

4. Fit a straight line to the given data : $y(-4) = 4$, $y(1) = 6$, $y(2) = 10$, and $y(3) = 8$ by the method of least squares.

5. Find the cubic curve that passes through the points $(-1, -8)$, $(0, 3)$, $(2, 1)$ and $(3, 2)$ using Newton divided difference formula.

6. From the following table find the values of y' and y'' at $x = 0$:

$x :$	0	1	2	3	4	5
$y :$	4	8	15	7	6	2

SECTION-C

7. Determine the largest eigen value and the corresponding eigen vector of the matrix

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$$

By power method.

8. a) Use the method of triangularization to solve the system of equations

$$2x + y + 4z = 12$$

$$8x - 3y + 2z = 20$$

$$4x + 11y - z = 33$$

b) Find a real root of the equation $f(x) = \cos x - 2x + 3 = 0$ by fixed point iteration method correct upto three decimal places.

9. a) Using Runge-Kutta fourth order method to find $y(0.4)$ given that

$$y' = \frac{y^2 - x^2}{y^2 + x^2}, y(0) = 1$$

With $h = 0.2$

- b) Solve the following system

$$x^2 - 2xy + 9.62 = 0,$$

$$xy - 2y^2 + 14.97 = 9,$$

by Newton-Raphson method with the initial values $x_0 = 2$ and $y_0 = 2$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.