B.Tech. Sixth Semester (Chemical Engineering) (CGS)

10165 : Computer Programming & Applications : 6 CH 03 / 6 PP 03

P. Pages : 2 **AW - 3248**

Time : Three Hours * 0 7 3 2 * Max. Marks : 80

Notes : 1. Answer **Three** question From Section "A" and **Three** question from Section "B".
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. a) Solve the following equation using Runge-Kutta second order and forth order formula. **10**

$\frac{dy}{dx} = y - x$, $y(0) = 2$ Find y (0.1) & y (0.2) correct to four decimal places with h = 0.1

b) Given dy/dx = 1 + xy. **4**
y (0) = 1, obtain the Taylor series for y (x) and compute y (0.1) correct to four decimal places.

OR

2. a) Solve $\frac{dy}{dx} = x^2y$ using Euler's predictor corrector method with the initial condition **8**
y (0) = 1, find y (0.5) using a step size of h = 0.1

b) Derive Euler's predictor and corrector formula Also give difference between them. **6**

3. a) Solve the following set of three linear equation in three variables using the Guass-elimination method. **7**

$$3x_1 + x_2 - 2x_3 = 9$$
$$-x_1 + 4x_2 - 3x_3 = -8$$
$$x_1 - x_2 + 4x_3 = 1$$

b) Find the inverse of the matrix **6**

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

OR

4. A liquid - liquid extraction process conducted in the Electrochemical material laboratory involved the extraction of Nickel from. aqueous phase into an organic phase. A set of experimental data is given bellow. **13**

Ni - aq. Phase, $X(g/\ell)$ - 2 2.5 3

Ni - organic phase, $Y(g/\ell)$ - 8.57 10 12

The Quadratic interpretation that estimate Y is given by $\because Y = a_1x^2 + a_2x + a_3 \quad 2 \le x \le 3$.

The solution for constant a_1, a_2, a_3, is given by

$$\begin{bmatrix} 4 & 2 & 1 \\ 6.25 & 2.5 & 1 \\ 9 & 3 & 1 \end{bmatrix} \begin{bmatrix} a_1 \\ a_2 \\ a_3 \end{bmatrix} = \begin{bmatrix} 8.57 \\ 10 \\ 12 \end{bmatrix}$$

Find the value of a_1, a_2, a_3, by Guass. Elimination method.

Estimate the value at Y at x = 2.39 g/ℓ

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5. a) Find the real root of the equation correct to three decimal places and between 0 and 0.5 for equation $4e^{-x}\sin x - 1$ Using Regula Falsi method. 8

b) Compute a real root from: 5
$f(x) = x^3 - 3x - 5 = 0$ using the Method of False Position.

OR

6. a) Use Newton Raphson method to obtain a root correct to three decimal places of following equation. sin x = 1-x 7

b) Use the method of false Position, to find out root of equation cos x- x e^x upto the four decimal place. 6

SECTION - B

7. a) Econornize the power series for the maximum error of 0.0005, 8

$$\text{Sin } x = \cdot X - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots\ldots$$

b) What do you mean by approximation of function? Explain in detail why we need to approximate a function? Which are the methods of approximation of function. 6

OR

8. a) Find the values of a, b & c so that $y : a + bx + cx^2$ is the best fit to data 8

x	0	1	2	3	4
y	1	0	3	10	21

b) Estimate the criteria for the 'Best' fit for straight line. 6

9. Minimize $F(x_1, x_2) = (x_1 - 2)^4 + 3(x_2 + 3)^2$ by the method of steepest descent using initial solution $X^o = (1,-2)$ 13

OR

10 a) Explain 6
i) Analytical method of optimization
ii) Gradient methods of optimization

b) Explain Fibonacci search for n total number of experiment and uncertainty defined by $a \le x \le b$ 7

11. Explain in detail: 13
1) Modular Programming
2) Subroutine libraries
3) Capacity optimization

OR

12. a) Explain Block diagram of preliminary aids for programming. 7

b) Describe how numerical method are implemented using subroutine libraries. 6

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