Scheme - I

Sample Question Paper

Program Name : **Diploma in Chemical Engineering**

Program Code : **CH**

22515

Semester : **Fifth**

Course Title : **Numerical Methods in Chemical Engineering (Elective)**

Marks : **70** **Time: 3 Hrs.**

Instructions:

(1) All questions are compulsory.

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data if necessary.

(5) Preferably, write the answers in sequential order.

Q.1) Attempt any FIVE of the following. **10 Marks**

a) Give any two applications of SCILAB software to solve numerical methods.

b) Compare Gauss Jordan and Gauss-Seidal methods for solving linear system of the form AX= B.

c) Give the condition for Simpson's 3/8 rule and state the formula.

d) State the order of convergence and convergence condition for Newton-Raphson method.

e) State the formula to solve second order differential equation using Runge-Kutta method.

f) Give any two applications of SCILAB software to solve algebraic equations.

g) Give the formula to solve second order differential equation using Taylor's Series method.

Q.2) Attempt any THREE of the following. **12 Marks**

a) Explain the use of SCILAB software for solution of differential and integral equations.

b) Explain method to compute inversion of matrix using Gauss elimination method.

c) Using Trapezoidal rule evaluate $\int_0^{\pi} \sin x \, dx$ by diving the range into 6 equal parts.

d) Find the root of $4x - e^x = 0$ that lies between 2 and 3 by Newton-Raphson method.

Q.3) Attempt any THREE of the following. **12 Marks**

a) Evaluate the integral $_0\int^4 (1-e^{-2x})\,dx$ by Simpson's 1/3 rule.

b) Find the root of the equation $xe^2 = \cos x$ by Regula-Falsi method.

c) Determine the positive root of $\ln(X^4) = 0.7$ using three iteration of the Bisection method with initial guesses 5 and 10.

d) Find by Taylor's Series method, the value of y at x=0.1 from $dy/dx=y^2+x$, y (0) =1.

Q.4) Attempt any THREE of the following. **12 Marks**

a) Evaluate the integral $_0\int^3 (5+3\cos x)\,dx$ by Trapezoidal rule.

b) Using Euler's method find y (0.1) given that dy/dx= x+y, y(0)=1.

c) Evaluate the integral $_0\int^3 x^2e^x\,dx$ by Simpson's 1/3 rule.

d) Find the root of the equation tanx=x, Correct to three decimal places using Newton-Raphson method.

e) Evaluate the integral $_0\int^{\pi/2} (6+3\cos x)\,dx$ by Simpson's 3/8 rule.

Q.5) Attempt any TWO of the following. **12 Marks**

a) Describe the use and features of SCILAB software in details for numerical methods.

b) Solve 10x+y+Z=12, 2x+10y+z=13, x+y+5z=7 by Gauss-Jordan method.

c) Evaluate the integral of the following tabular data with Simpson's 3/8 rule.

x	0	0.1	0.2	0.3	0.4	0.5
F(x)	1	8	4	3.5	5	1

Q.6) Attempt any TWO of the following. **12 Marks**

a) Find the smallest positive root of the equation $xe^{-2x} = 1/2 \sin x$. Correct to three decimal places using Newton-Raphson method.

b) Determine the value of y when x=0.1 given that y(0)=1 and $dy/dx=x^2+y$ by using Euler's modified method.

c) Solve the equation dy/dx=1/x+y, y(0)=1 for y(0.1) and y(0.2) using second order Runge- Kutta method.

Scheme - I

Sample Test Paper - I

Program Name : **Diploma in Chemical Engineering**

Program Code : **CH**

22515

Semester : **Fifth**

Course Title : **Numerical Methods in Chemical Engineering (Elective)**

Marks : **20** **Time: 1 Hour.**

Instructions:

(1) All questions are compulsory.

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data if necessary.

(5) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR. **08 Marks**

a) Give any two applications of SCILAB software to solve differential equations.

b) State the condition for convergence of Gauss-Seidal method.

c) Name the two direct methods to solve a system of linear equations.

d) Give any two applications of SCILAB software to solve numerical methods.

e) Give the transpose of the matrix of coefficients.

f) State the formula to solve given numerical integration by applying Trapezoidal Rule.

Q.2 Attempt any THREE. **12 Marks**

a) Explain the features of SCILAB software for application of numerical methods.

b) Solve the given system equations by using Gauss-seidal iteration method 20x-y-2z=17, 3x+20y-z= -18, 2x-3y+20z=25.

c) Draw the flow chart for Gauss elimination method.

d) Using Gauss-Jordan method find the inverse of $A = \begin{vmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{vmatrix}$

e) Solve 10x+y+Z=12, 2x+10y+z=13, x+y+5z=7 by Gauss- Jordan method.

f) Evaluate the integral $\int_0^{\pi/2} (6+3\cos x)\, dx$ by Trapezoidal rule.

Scheme - I

Sample Test Paper - II

Program Name : **Diploma in Chemical Engineering**

Program Code : **CH**

22515

Semester : **Fifth**

Course Title : **Numerical Methods in Chemical Engineering (Elective)**

Marks : **20** **Time: 1 Hour.**

Instructions:

(1) All questions are compulsory.

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data if necessary.

(5) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR. **08 Marks**

a) Give the condition for Simpson's 1/3 rule and state the formula.

b) State the formula to solve given algebraic equation by Bisection method.

c) Give the criterion for the convergence of Newton-Raphson method.

d) Give the formula to solve second order differential equation using Taylor's Series method.

e) State the formula to solve given numerical integration by Euler's method.

f) State the formula to solve given numerical integration by Runge-Kutta method.

Q.2 Attempt any THREE. **12 Marks**

a) Evaluate the integral $_0\int^4 (1-e^{-2x})\, dx$ by Simpson's 3/8 rule.

b) Find the smallest positive root of the equation $x^3+5x+1 =0$. Correct to three decimal places using Newton-Raphson method

c) Find the root of the equation $\cos x - xe^x = 0$ by Regula-Falsi method.

d) Using Modified Euler's method find y (0.1) if $dy/dx= x^2+y^2$, $y(0)=1$.

e) Consider initial value problem $dy/dx=y-x^2+1$, $y(0)=0.5$ using second order Runge-Kutta method find y(0.4) and y(0.6).

f) Find by Taylor's Series method, the value of y at x=0.1 from $dy/dx=y^2+x$, $y(0) =1$.