Unit III

5. Solve the equation $y'' = x + y$ with the boundary condition $y(0) = y(1) = 0$. **15**

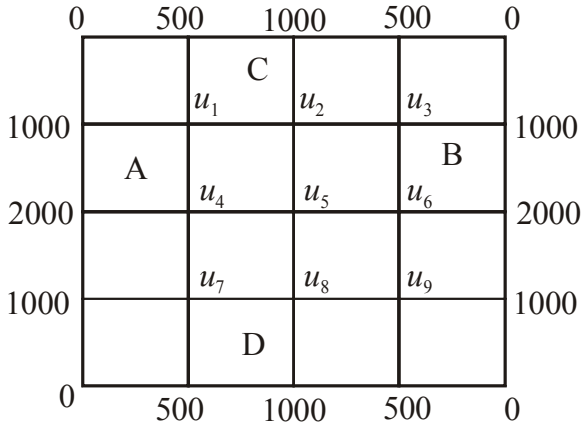
6. Apply Runge-Kutta method to find approximate value of y for $x = 0.2$ in step of 0.1, if :

$$\frac{dy}{dx} = x + y^2$$

given that $y = 1$ where $x = 0$. **15**

Unit IV

7. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in figure : **15**



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18AA1351

M. Tech. EXAMINATION, May 2019

(First Semester)

(C Scheme) (Re-appear)

CHE

CHE501C

Mathematical and Statistical Methods in Chemical Engg.

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) If P is the pull required to lift a load W by means of a pulley block, find the linear law of the form P = mW + C connecting P and W. Using the following data ;

P	:	14	17	21	25
W	:	50	70	100	120

where P and W are taken in kg-wt.

Compute P when W = 150 kg. **7**

(b) Using Newton's backward difference formula, construct an interpolating polynomial of degree three for the data :

$f(-0.75) = -0.0718125$

$f(-0.5) = -0.0247$

$f(-0.25) = -0.3349375$

$f(0) = 1.10100$

Hence find $f\left(-\frac{1}{3}\right)$. **8**

2. (a) Find the real root of the equation $x^2 - 2x - 5 = 0$ by method of false position correct to three decimal places.

(b) Find the root of the equation $x^2 - 4x - 9 = 0$ using bisection method correct to three decimal places.

Unit II

3. Solve the equation :

$$10x + y - z = 11.19$$
$$x + 10y + z = 2.08$$
$$-x + y + 10z = 35.61$$

by Jacobi iteration method correct to two decimal places. **15**

4. (a) Solve the equations : **12**

$$10x - 7y + 3z + 5u = 6$$
$$-6x + 8y - z - 4u = 5$$
$$3x + y + 4z + 11u = 2$$
$$5x - 9y - 2z + 4u = 7$$

by Gauss-Jordan Method.

(b) Explain Gauss Elimination Method Theoretically. **3**

8. Solve the equation

$$\nabla_u^2 = -10\,(x^2 + y^2 + 10)$$

over the square with sides $x = 0$ y, $x = 3 = y$ with $u = 0$ on the boundary and mesh length = 1. **15**

8. Solve the equation

$$\nabla_u^2 = -10\,(x^2 + y^2 + 10)$$

over the square with sides $x = 0$ y, $x = 3 = y$ with $u = 0$ on the boundary and mesh length = 1. **15**