SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | | Total number of pages:[2 ]

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CHE4th Sem

# Mathematical Methods in Chemical Engg.

Subject Code:BTAM-401A BTCH-401A (RG|RP)

Paper ID: M|18 (for office use)

Time allowed: 3 Hrs (2015 batch onwards) Max Marks:60

To be specified by paper setter

**Important Instructions:**

- **All questions are compulsory**
- **Assume any missing data**
- **Additional instructions, if any**

## PART A (2×10)

Q. 1. Short-Answer Questions:

(a) State and prove first shifting property of laplace transform.

(b) Discuss Cramer's rule.

(c)Write the normal equations of parabola.

(d) Define sectional five point formula?

(e) Define Curve Fitting?

(f) Discuss the criteria to choose intial approximation in Newtown's-Raphsons method.

(g) Define Eigen value Eigen vector?

(h) Define pivoting?

(i) Write the normal equation of Straight line.

(j) Check whether $1.01x + 2y = 2.01$ , $x+2y=2$ is conditioned or not?

## PART B (8×5)

Q. 2. Solve by using LU Decomposition method $x+y+z=3$, $2x-y+3z=16$ and $3x+y-z=-3$ COa

OR

Apply Gauss-Jordon eliminatation method to solve the equation $x+y+z=9$ , $2x-3y+4z=13$ and $3x+4y+5z=40$ COa

Q. 3. Determine the largest Eigen value and the corresponding Eigen vector of the matrix

$$\begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$$

OR

Use Faddeev's method to find the Chracterstics polynomial and inverse of the following matrices $A=\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & -1 & 2 \end{pmatrix}$. Also find eigen value of A Cob

Q. 4. Using Langrange's Interpolation formula fins y(10) from the following table COc

| x | 5 | 6 | 9 | 11 |
|---|---|---|---|---|
| y | 12 | 13 | 14 | 16 |

OR

Derive Simpson's rule and hence evaluate $\int_0^{\pi} Cosxdx$ COc

Q. 5. Given $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ with y(0)=1 .Find y(0.1) and y(0.2) using Runge-Kutta Method of $4^{th}$ order. Cod

OR

Find the curve of best fit of the type $y = ae^{bx}$ to the following data by the method of least squares: Cod

| x | 1 | 5 | 7 | 9 | 12 |
|---|---|---|---|---|---|
| y | 10 | 15 | 12 | 15 | 21 |

Q. 6. Evaluate $L^{-1}\left(\frac{s^2}{(s^2+4)^2}\right)$ by Convulation theorem Coe

OR

Solve the Differential equation by using laplace transforms Coe

$\frac{d^2x}{dt^2} + 9x = cos2t\,; x(0) = 1 and\ x'(0) = 1$