**B.TECH SEM - V (2007 COURSE) (CHEMICAL ENGG.) :**
**SUMMER - 2018**
**SUBJECT: CHEMICAL ENGINEERING MATHEMATICS**

Day : **Tuesday** | **S-2018-2649** | Time : **10.00 AM TO 01.00 PM**
Date : **22/05/2018** | Max. Marks: 80

---

**N. B. :**

1) **Q.No.1** and **Q.No.5** are **COMPULSORY.** Out of remaining questions, attempt ANY TWO questions from each section.
2) Figures to the right indicate **FULL** marks.
3) Both the sections should be written in the **SEPARATE** answer books.
4) Use of non programmable **CALCULATOR** is allowed.
5) Assume suitable data, if necessary.

---

## SECTION-I

**Q.1** **a)** Solve following system of equation using Guass elimination method. **(05)**

$2x+y+z=10$

$3x+2y+3z=18$

$x+4y+9z=16$

**b)** Explain in detail step wise procedure of Simplex method for LPP. **(05)**

**c)** Write down the formula for following numerical methods. **(04)**

i) Secant method
ii) Muller's method
iii) Euler's method
iv) Forth order Runge-Kutta method

**Q.2** Determine the largest Eigen values and corresponding Eigen vectors of the matrix. **(13)**

$$A=\begin{bmatrix}1 & 6 & 1\\ 1 & 2 & 0\\ 0 & 0 & 3\end{bmatrix}$$

**Q.3** Using Simplex method, **(13)**
Maximize: $Z = 5x_1 + 3x_2$
Subject to :

$x_1+x_2\le 2$

$5x_1+2x_2\le 10$

$3x_1+8x_2\le 12$

$x_1, x_2 \ge 0$

**Q.4** **a)** Solve $\frac{dy}{dx}=x^2+2xy, y(0)=0$ by Picard's method upto the third approximation. **(06)**

**b)** Solve the initial value problem $\frac{dy}{dx}=1+xy^2, y(0)=1; for\ x=0.4$ by Milne's predictor - corrector method correct to three decimal places, given that **(07)**

| x | 0.1 | 0.2 | 0.3 |
|---|---|---|---|
| y | 1.105 | 1.223 | 1.355 |

**P.T.O.**

## SECTION-II

**Q.5** **a)** Given values: **(05)**

| x | 5 | 7 | 11 | 13 | 17 |
|---|---|---|---|---|---|
| f(x) | 150 | 392 | 1452 | 2366 | 5202 |

Evaluate: f (9) by using Lagrange's interpolation formula.

**b)** Three cities A, B, C are equidistant from each other. Motorist travels from A to B at 40 km/hr, from B to C at 50 km/hr, from C to A at 60 km/hr. Determine the average speed of the motorist. **(04)**

**c)** If w = log (z), find $\frac{dw}{dz}$ and determine where w is non analytic. **(05)**

**Q.6** Evaluate using Romberg integration method. **(13)**

$$I=\int_0^1\left(\frac{1}{1+x}\right)dx$$

Correct up to three decimal places.

**Q.7** Find the mean, median and mode for the following: **(13)**

| Mid value | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 22 | 19 | 14 | 3 | 4 | 6 | 1 | 1 |

**Q.8** Show that function defined by $f(z)=z^3+1-iz^2$ **(13)**
Satisfies Cauchy-Riemann equations.

* * * * *