B.TECH. SEM -V (CHEMICAL 2014 COURSE (CBCS) : WINTER - 2017

SUBJECT : CHEMICAL ENGINEERING MATHEMATICS

Day : **Tuesday**
Date : **16/01/2018**

W-2017-2113

Time : **02.30 PM TO 05.30 PM**
Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Assume suitable data if necessary.

Q.1 A parachutist of mass 'm' jumps out of a stationary hot air balloon. Compute the mass m so that velocity is V = 35 m/s at t = 9s. Drag coefficient = 15 kg/s. Use false position method. **[10]**

OR

Use secant method to estimate the root of $f(x) = e^{-x} - x$. Start with initial estimate 0 and 1.

Q.2 Using Runge – Kutta method of order 4, find y for $x = 0.1, 0.2, 0.3$ given that **[10]**
$\frac{dy}{dx} = xy + y^2,\ y(0) = 1$.

OR

Use Milne's predictor corrector method to obtain the solution of the equation
$\frac{dy}{dx} = x - y^2$ at $x = 0.8$ given that
$y(0) = 0,\ y(0.2) = 0.02,\ y(0.4) = 0.0795,\ y(0.6) = 0.1762$.

Q.3 Use Romberg's integration to evaluate **[10]**
$$I = \int_1^2 \left(2x + \frac{3}{x}\right)^2 dx.$$

OR

Apply Lagrange's formula inversely to obtain a root of the equation $f(x) = 0$. Given that $f(30) = -30, f(34) = -13, f(38) = 3$ and $f(42) = 18$.

Q.4 Solve following equations using Gaussian elimination method: **[10]**
$2x + y + z = 10$
$3x + 2y + 3z = 18$
$x + 4y + 9z = 16$

OR

P.T.O.

Solve using LU decomposition method:

$2x+3y+z=9$

$x+2y+3z=6$

$3x+y+2z=8$

Q.5 The following is the frequency distribution of a random sample of weekly earnings of 509 employees. **[10]**

Weekly earnings	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
No. of employees	3	6	10	15	24	42	75	90	79	55	36	26	19	13	9	7

Calculate the average weekly earnings.

OR

Fit a straight line to the x and y values in the first two columns of following table:

x	1	2	3	4	5	6	7
y	0.5	2.5	2	4	3.5	6	5.5

Q.6 Use golden section search method to find maximum of $f(x)=2\sin x-\frac{x^2}{10}$ within $x_l=0$ and $x_\mu=4$. **[10]**

OR

Using simplex method:

Maximize $z=5x_1+3x_2$

Subject to

$x_1+x_2\le 2$

$5x_1+2x_2\le 10$

$3x_1+8x_2\le 12$

$x_1,\ x_2\ \ge 0$

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