M. Tech. –I (Chemical Engineering) (CBCS – 2015 Course) :
WINTER - 2018
SUBJECT: APPLIED MATHEMATICS FOR CHEMICAL ENGINEERING

Day: Monday
Date: 03/12/2018

Time: 11.00 AM TO 02.00 PM
Max Marks: 60

W-2018-3128

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Answers to both the sections should be written in **SEPARATE** answer books.

SECTION – I

Q.1 Write note on total numerical error, how this can be controlled? **(10)**

OR

Q.1 Explain stepwise short cut method for one way ANOVA **(10)**

Q.2 Find the real root of the equation $x^3 - 2x - 5=0$ using Secant method **(10)**
Let the two initial approximations be given by $x_{-1}=2$ and $x_0=3$

OR

Q.2 Determine the real root of $x^{3.3}= 79$ with the False-position method to within $\varepsilon_s=$ **(10)**
0.1%. Use initial guesses of 3.0 and 4.0

Q.3 Specific volume of superheated steam is listed in steam table at various **(10)**
temperatures, for e.g. at a pressure of 2950 N/m^2 absolute.

T, ^{0}C	700	720	740	760	780
V, m^3	0.1058	0.128	0.1462	0.1603	0.1703

Determine volume at T=750^{0}C. Use any interpolation method and justify

OR

Q.3 Employ inverse interpolation using a cubic interpolating polynomial and **(10)**
bisection to determine the value of x that corresponds to $f(x)$ =0.3 for the following tabulated data

x	1	2	3	4	5	6	7
$f(x)$	1	0.5	0.3333	0.25	0.2	0.1667	0.1429

P.T.O.

SECTION – II

Q.4 The values of concentration measured in the exit pipe of reactor are as follows **(10)**

t, min	0	5	10	15	20	25	30	35	40	45	50
C, mg/m^3	10	22	35	47	55	58	52	40	37	32	34

Use numerical integration to evaluate the equation $M = Q \int_{t_1}^{t_2} C\, dt$
to find the mass enters or leaves the reactor.

OR

Q.4 Prove that **(10)**

$I = \frac{4}{3} I(h_2) - \frac{1}{3} I(h_1)$ with the help of Romberg integration

Q.5 Solve the boundary value problem **(10)**
$y'' - 64y + 10 = 0$; $y(0) = y(1) = 0$ by finite difference method. Compute the value of y(0.5) and compare with analytical value.

OR

Q.5 Solve the following problem with 4th order Runge-Kutta method **(10)**

$\frac{d^2y}{dx^2} + 0.5\frac{dy}{dx} + 7y = 0$; Where y(0)=4 and y'(0)= 0

Solve from x=0 to 5 with h=0.5

Q.6 Describe any one of the common statistical tests used by engineers and its advantages and limitations **(10)**

OR

Q.6 Describe the importance of design of experiments **(10)**

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