B.TECH SEM – V (2007 COURSE) (MECHANICAL ENGG.) :
WINTER - 2017
SUBJECT : NUMERICAL METHODS IN MECHANICAL ENGINEERING

Day **Saturday** Time **02.30 PM TO 05.30 PM**
Date **20/01/2018** **W-2017-2478** 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) Answers to both the sections should be written in **SEPARATE** answer books.
3) Use of non programmable **CALCULATOR** is allowed.
4) Figures to the right indicate **FULL** marks.
5) Assume suitable data if necessary.

SECTION – I

Q.1 **a)** Write short note on total numerical error. **[04]**
b) Explain Newton Raphson method. **[05]**
c) Explain gauss elimination method. **[05]**

Q.2 The velocity of falling parachutist can be computed by $v(t)=\frac{gm}{c}\left(1-e^{-(c/m)t}\right)$ **[13]**
use first order error analysis to estimate the error of v at t = 6, g = 9.8 c = 12.5 ± 1.5 and m = 50 ± 2.

Q.3 Determine the real root of $f(x)=5x^3-5x^2+6x-2$ using bisection method in the interval [0, 1]. **[13]**

Q.4 Use gauss Jordon to solve: **[13]**

$$8x_1+2x_2-2x_3=-2$$
$$10x_1+2x_2+4x_3=4$$
$$12x_1+2x_2+2x_3=6$$

SECTION – II

Q.5 **a)** Explain least square regression for straight line. **[05]**
b) Derive the relation for trapezoidal rule. **[05]**
c) Write a program for Euler's method. **[04]**

Q.6 Dynamic viscosity of water μ is related to temperature T (^{0}C) in the following manner. **[13]**

T	0	5	10	20	30	40
μ	1.787	1.519	1.307	1.002	0.7975	0.6529

Use interpolation to predict μ at T = 7.5^{0}C.

Q.7 Data for $f(x)=0.2+25x-200x^2+675x^3-900x^4+400x^5$ with unequally spaced value of x is given below: **[13]**

x	0.0	0.12	0.22	0.32	0.36	0.40
$f(x)$	0.2	1.309729	1.305241	1.743393	2.074903	2.456000

Integrate $f(x)$ from $x=0.0$ to $x=0.40$.

Q.8 Use Heun's method to integrate $\frac{dy}{dx}=4e^{0.8x}-0.5y$ from $x=0$ to $x=4$ with a step size of 1. The initial condition at x = 0 is y = 2. **[13]**

* * * *