B.TECH SEM – V (2007 COURSE) (MECHANICAL ENGG.) :
SUMMER - 2018
SUBJECT : NUMERICAL METHODS IN MECHANICAL ENGINEERING

Day : **Friday** Time : **10.00 AM TO 01.00 PM**
Date : **25/05/2018** **S-2018-2683** Max. Marks : 80

N.B.

1) Q.1 and Q.5 are **COMPULSORY.** Out of the remaining attempt any **TWO** questions from Section I and Section – II.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in **SEPARATE** answer book.
4) Use of non-programmable calculator is allowed.

SECTION – I

Q.1 **a)** Write a computer program for bisection method. **(05)**

b) Write a function in C language for gauss elimination (only forward elimination) **(05)**

c) Write short note on total numerical error. **(04)**

Q.2 The velocity of falling parachutist can be computed by **(13)**

$$v(t)=\frac{gm}{c}\left[1-e^{-\left(\frac{c}{m}\right)t}\right]$$

Use first order error analysis to estimate the error of v at t = 6, if g = 9.8 and m = 50 but c = 12.5$\pm$ 1.5.

Q.3 Use gauss elimination method to solve **(13)**

$$3x_1-0.1x_2-0.2x_3=7.85$$
$$0.1x_1+7x_2-0.3x_3=-19.3$$
$$0.3x_1-0.2x_2+10x_3=71.4$$

Q.4 **a)** Write a C Program for Gauss-Siedal method. **(07)**

b) Explain partial Pivoting with suitable example. **(06)**

SECTION – II

Q.5 **a)** Write a program to fit straight line through given data point. **(05)**

b) Write a program for Simpson's 1/3rd method. **(04)**

c) Explain predictor and corrector method. **(05)**

P.T.O.

Q.6 Fit a straight line for the following data **(13)**

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

And write a computer program for same.

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	2.4560000

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

Q.8 Following equation can be used to analyze the unforced oscillation of an automobile shock absorber $m\frac{d^2x}{dt^2} + c\frac{dx}{dt} + kx = 0$. Given $m = 1.2\times10^6, c = 10^7, k = 1.25\times10^9$. Solve for both displacement and velocity from $t = 0$ to 1.

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