

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 110303

Roll No.

**B.Tech.**

**(SEM. III) THEORY EXAMINATION, 2015-16**  
**COMPUTER BASED NUMERICAL AND**  
**STATISTICAL TECHNIQUES**

[Time:3 hours]

[Total Marks:100]

**Section-A**

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short. (10x2=20)
  - (a) Describe briefly the floating point representation of numbers.
  - (b) Suppose 1.414 is used as an approximation to  $\sqrt{2}$ . Find the absolute and relative errors.
  - (c) Express  $2 T_0(x) - \frac{1}{4} T_2(x) - \frac{1}{8} T_4(x)$  as polynomials in  $x$ .
  - (d) Differentiate between ill conditioned and well conditioned methods.
  - (e) Explain underflow and overflow conditions of error in floating point's addition and subtraction.

- (f) Write difference between the truncation error and round off error.
- (g) Differentiate false position method and secant method.
- (h) How can the rate of convergence of two methods be compared, explain by taking an example?
- (i) Find the number of terms of the exponential series such that their sum gives the value of  $e^x$  correct to six decimal places at  $x=1$ .
- (j) The numbers  $0.01850 \times 10^3$  and  $386755$  have.....and.....significant digits respectively.

### Section-B

Attempt any five questions from this section.  $(5 \times 10 = 50)$

2. The following table gives the marks obtained by 100 students in Statistics:

Marks	Number of Students
30-40	25
40-50	35
50-60	22
60-70	11
70-80	7

Use Newton's forward formula to find the number of students who got more than 55 marks.

3. Solve the following system of equation by Gauss elimination method:

$$x_1 + 2x_2 + 3x_3 + 4x_4 = 10$$

$$7x_1 + 10x_2 + 5x_3 + 2x_4 = 40$$

$$13x_1 + 6x_2 + 2x_3 - 3x_4 = 34$$

$$11x_1 + 14x_2 + 8x_3 - x_4 = 64$$

4. The speed  $v$  meters per second of a car,  $t$  seconds after its starts, is shown in following table:

$t$	$V$
0	0
12	3.6
24	10.08
36	18.9
48	21.6
60	18.54
72	10.26
84	5.40
96	4.50
108	5.40
120	9.00

Using Simpson's 1/3rd rule find the distance traveled by the car in 2 minutes.

5. Find the form of function  $F(x)$  of the following table using Lagrange's method.

x	0	1	4	5
F(x)	8	11	68	123

6. Find a real root of the equation  $2x - \log 10x = 7$ , correct to three decimal places using Aitken's method and Iteration method. Also show how the rate of convergence of Aitken's method is rapid than iteration method.
7. A real root of the equation  $f(x) = x^3 - 5x + 1 = 0$ , lies in the interval  $(0,1)$ . Perform four iterations of the secant method.
8. Evaluate the intergral  $I = \int dx/(x^2+1)$  in the interval  $[0,1]$  using the Lobatto and Radau 3 point formula.
9. Find the value of integral, using Gauss-Legendre three point integration rule.

$$I = \int_2^3 \frac{\cos 2x}{1 + \sin x} dx$$

### Section-C

Attempt **any two** questions from this section. (15×2=30)

10. Using Gram-Schmidt orthogonalization process, compute the first three orthogonal polynomials  $P_0(X)$ ,  $P_1(X)$ ,  $P_2(X)$  which are orthogonal on interval  $[0,1]$  w.r.t. weight function  $W(x)=1$ . Using these polynomials obtain least square approximation of first degree for  $f(x)=x^{1/2}$  on interval  $[0,1]$ .
11. Fit a natural cubic Spline to every subinterval for the following data.

x	y
0	2
1	-6
2	-8
3	2

Hence compute:  $y(2.5)$

12. (a) Apply Milne's predictor-corrector method, find  $y(0.8)$  if  $y(x)$  is the solution of  $dy/dx = 1 + y^2$ . Given  $y(0)=0$ ,  $y(0.2) = 0.2027$ ,  $y(0.4) = 0.4228$  and  $y(0.6) = 0.6841$ .
- (b) Apply Runge kutta fourth order method to find  $y(0.1)$  for the initial value problem,  $dy/dx = y - x$  Given  $y(0)=2$ .

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