Printed Pages—4 **TAS—302**

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

PAPER ID : 9967 Roll No. | | | | | | | | | | |

B.Tech.

THIRD SEMESTER EXAMINATION, 2005-2006

COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt ALL questions.*

(ii) All questions carry equal marks.

(iii) In case of numerical problems assume data wherever not provided.

(iv) Be precise in your answer.

1. Attempt *any four* parts of the following : **(5x4=20)**

(a) Let x^* approximate x correct upto n significant digits if e^x is evaluated for x, $-8 \le x \le 9$, then what should be relative error ?

(b) Obtain polynomial approximation to $f(x) = (1-x)^{1/2}$ over [0, 1], by means of Taylor expansion about $x=0$. Find the number of terms required in the expansion to obtain results correct to 5×10^{-1} for $0 \le x \le 1/2$.

(c) Find a real root of the equation $x^3 + x^2 - 1 = 0$ on the interval [0, 1] with an accuracy of 10^{-4} by the iteration method.

(d) Find all the roots of $\cos x - x^2 - x = 0$ to five decimal places by Newton-Raphson method.

(e) Show that the following sequence has convergence of the second order with the same limit $\sqrt{a}$

$$x_{n+1} = \frac{1}{2} x_n \left(3 - \frac{x_n^2}{a}\right).$$

(f) Do two iteration of Muller's method to solve $x^3 - 2x + 1 = 0$ starting with $x_0 = 0.5$, $x_2 = 0$, $x_1 = 1$.

2. Attempt *any four* parts of the following : **(5x4=20)**

(a) Prove the following :

$$hD \equiv \log(1+\Delta) \equiv -\log(1-\nabla) \equiv \text{Sinh}^{-1}(\mu\delta)$$

(b) From the following table :

x :	10°	20°	30°	40°	50°	60°	70°	80°
Cos x :	.9848	.9397	.8660	.7660	.6428	.5000	.3420	.1737

Calculate Cos 25° and Cos 73° using Gregory Newton formula.

(c) Form the following table, find the value of $e^{1.17}$ using Gauss's forward formula :

x :	1.00	1.05	1.10	1.15	1.20	1.25	1.30
e^x :	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

(d) Using Everett's formula, evaluate f(30) if f(20) = 2854, f(28) = 3162, f(36) = 7088 f(44) = 7984.

(e) For the following table find f(x) as a polynomial in x using Newton's divided difference formula.

x :	5	6	9	11
f(x) :	12	13	14	16

(f) Using Lagrange interpolation formula, calculate f(3) from the following table :

x :	0	1	2	4	5	6
f(x) :	1	14	15	5	6	19

3. Attempt *any two* parts of the following : **(10x2=20)**

(a) If $y=f(x)$ and y_n denotes $f(x_o+nh)$, prove that, if powers of h above h^6 be neglected,

$$\left(\frac{dy}{dx}\right)_{x=x_0}=\frac{3}{4h}\left[y_1-y_{-1}-\frac{1}{5}(y_2-y_{-2})+\frac{1}{45}(y_3-y_{-3})\right].$$

(b) Find $\int_0^6 \frac{e^x}{1+x}dx$ approximately using Simpson's 3/8th rule on integration.

(c) Derive weddle's rule of integration. Hence, evaluate

$$\int_0^1 \frac{1}{1+x^2}dx$$

4. Attempt *any two* parts of the following : **(10x2=20)**

(a) Give $\frac{dy}{dx}=1+y^2$, where $y=0$ when $x=0$. Find $y(0.2)$, $y(0.4)$ and $y(0.6)$ by using Runge-Kutta Fourth order formula.

(b) Apply predictor-corrector method to find a solution of the differential equation $\frac{dy}{dx}=x-y^2$ in the range $0\le x\le 1$ for boundary condition $y=0$ at $x=0$.

(c) Applying Euler's method to the equation $\frac{dy}{dx}=\lambda y$, given $y(x_0)=y_0$, determine its stability zone ? What would be the range of stability when $\lambda=-1$?

5. Attempt *any two* parts of the following : **(10x2=20)**

(a) Fit a second degree parabola to the following data, taking y as dependent variable

x :	1	2	3	4	5	6	7	8	9
y :	2	6	7	8	10	11	11	10	9

(b) Find the multiple linear regression of X_1 on X_2 and X_3 from the data relating to three variables :

X_1 :	4	6	7	9	13	15
X_2 :	15	12	8	6	4	3
X_3 :	30	24	20	14	10	4

(c) In a factory producing spark plug the number of defectives found in inspection of 20 lots of 100 each, is given below.

Lot No	No. of defectives	Lot No	No. of defectives
1	5	11	4
2	10	12	7
3	12	13	8
4	8	14	3
5	6	15	3
6	4	16	4
7	6	17	5
8	3	18	8
9	3	19	6
10	5	20	10

Construct appropriate control chart and state whether the process is in statistical control.

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