Printed Pages : 4 **TAS302**

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

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

B.Tech

(SEM III) ODD SEMESTER THEORY EXAMINATION 2009-10

COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

Time : 3 Hours] *[Total Marks : 100*

Note : (1) *Attempt **all** questions.*

(2) *All questions carry equal marks.*

1 Attempt any **four** parts of the following :

(a) Discuss two important computer arithmetic systems. Illustrate with examples that associatiative laws of floating point arithmetic do not hold in numerical computation.

(b) Derive the series : $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots$

Compute the number of terms required to estimate $\cos(\pi/4)$ so that the result is correct to atleast two significant digits.

(c) In a triangle ΔABC, $a = 6\ cm$, $c = 15\ cm$, $\angle B = 90°$. Write a program in 'C' to find the absolute error in the computed value of A, if possible errors in a and c are 1/5% and 1/7% respectively.

(d) Develop an iteration formula to find a real root of the equation : $x \sin x + \cos x = 0$. Find it in the vicinity of $x_0 = \pi$.

(e) Use the iteration method to find a real root of the equation : $3x - \sqrt{1+\sin x} = 0$ correct to five decimal places.

(f) Use Muller's method to obtain a root of the equation : $\cos x - x e^x = 0$ in the interval $(0, 1)$.

2 Attempt any **four** parts of the following :

(a) Prove : $\Delta - \nabla = -\Delta\nabla$

(b) Estimate the missing term in the table :

x	0	1	2	3	4
$f(x)$	1	3	9	?	81

(c) Apply Stirling's formula to find a polynomial of degree three which takes the following values of x, y :

x	2	4	6	8	10
y	−2	1	3	8	20

(d) Write an algorithm of any central difference interpolation formula.

(e) Apply Langrange's formula to find a cubic polynomial which approximates the data :

x	−2	−1	2	3
$y(x)$	−12	−8	3	5

(f) A function $f(x)$ satisfies the conditions : $f(0)=1$, $f'(0)=1$, $f(1)=0$, $f'(1)=0$. Use Hermite interpolation to approximate $f(x)$ by a polynomial. Also evaluate the maximum value of $f(x)$ in $[0, 1]$.

3 Attempt any **two** parts of the following :

(a) State the importance of numerical differentiation. Find $f'(0.6)$ and $f''(0.6)$ from the following table :

x	0.4	0.5	0.6	0.7	0.8
$f(x)$	1.5836	1.7974	2.0442	2.3275	2.6510

(b) State the need and scope of numerical integration. Use Simpson's rule to estimate the integral.

$\int_0^2 e^{x^2} dx$ with a stepsize 0.5.

(c) The area A inside the closed curve. $y^2 + x^2 = \cos x$ is given by $A = 4\int_0^{\alpha} (\cos x - x^2)^{1/2} dx$ where α is the positive root of the equation $\cos x = x^2$. Compute the area with an absolute error less than 0.05.

4 Attempt any **two** parts of the following :

(a) Apply Runge-Kutta fourth order method to find $y(0.1)$, $y(0.2)$ and $y(0.3)$ for the initial value problem $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$. Also, find $y(0.4)$ using Adam's method.

(b) Solve the initial value problem :

$y' = x + \sin(\pi y);\ y(1) = 0,\ 1 \le x \le 2$ by Milne's predictor-corrector method.

(c) Discuss the stability of Euler's method applied to the initial value problem. $y' = \lambda y,\ y(x_0) = y_0$.

5 Attempt any **two** parts of the following :

(a) State various methods for curve-fitting. Obtain the cubic splines approximation for the function given by the following table :

x	0	1	2	3
$f(x)$	1	2	5	11

with the end conditions $M_0 = 0 = M_3$.

(b) State objectives of control charts. A drilling machine bores holes with a mean diameter of 0.5230 cm and a standard deviation of 0.0032 cm. Calculate the 2-sigma and 3-sigma upper and lower control limits for means of sample of 4.

(c) Define lines of regression. Find the lines of regression for the given data :

x	50	100	150	200	250	300	350
y	30	65	90	130	150	190	200

Also find the coefficient of correlation for the above data.
