B.C.A. IIIrd Semester Examination, 2022

COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

Paper : BCA–301

Time : 3 Hours] *[M.M.*

Note : Answer any *five* questions. All questions carry equ marks.

1 (a) If $U = \frac{4x^2y^3}{z^4}$ and errors in x, y, z be 0.001, compute the relative maximum error in U when $x = y = z = 1$.

(b) Find by Newton-Raphson method, the real root of the equation $3x = \cos x + 1$.

2 Solve the following system by Gauss-Seidel method :

$$10x + 2y + z = 9$$
$$2x + 20y - 2z = -44$$
$$-2x + 3y + 10z = 22$$

3. Find a root of the equation $x^3 - x - 11 = 0$, using the Bisection method correct to three decimal places.

4. (a) Evaluate :

(i) $\Delta^2 \cos 2x$

(ii) $\Delta \dfrac{1}{x^2 + 3x + 2}$

(b) Estimate the missing term in the following table :

x	0	1	2	3	4
$f(x)$	1	3	9	—	81

5. (a) Apply Bessel's formula to obtain Y_{25}, given $Y_{20} = 2854$, $Y_{24} = 3162$, $Y_{28} = 3544$, $Y_{32} = 3992$.

(b) Use Lagrange's interpolation formula to find the value of y when $x = 10$ if the following values of x and y are given :

x	5	6	9	11
y	12	13	14	16

6. Given that :

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ at $x = 1.1$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$

7. Evaluate $\int_4^{5.2} \log x \, dx$ by :

(i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rule

(iii) Simpson's $\frac{3}{8}$ rule

8. Apply Runge-Kutta method to find approximate value of y for $x = 0.2$ in steps of 0.1 if $\frac{dy}{dx} = x + y$, given that $y = 1$ where $x = 0$.

9. Fit a second degree parabola to the following data :

x	10	15	20	25	30	35	40
y	11	13	16	20	27	34	41

(a) What are the *four* main compounds of a time series and explain it.

(b) Use Chi-square test, A survey of 320 families with 5 children is given below :

No. of boys	5	4	5	2	1	0	Total
No. of girls	0	1	2	3	4	5	
No. of families	14	56	110	88	40	12	320

Is this result consistent with hypothesis i.e. the male and female birth are equally possible ?

[Given for 5 degrees of freedom χ^2 at the level of significance is 11.07].