Roll No. .....

Total No. of Questions : 9] [Total No. of Printed Pages : 8

(2040)

B.C.A. (CBCS) RUSA VIth Semester Examination

3839

NUMERICAL METHODS

Paper : BCA-0602

Time : 3 Hours] **[Maximum Marks : 70**

Note :– Attempt *four* questions in all, selecting *one* question *from each* of the Sections B, C, D and E. Question No. **1** is compulsory.

Section–A

(Compulsory Question)

1. (A) Answer all the following ten objective questions with 1 mark each on the answer book.

(i) If $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots\ldots\ldots$

$-\infty$, is replaced by $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!}$,

then this approximation leads to an error known as :

(a) Inherent error

(b) Rounding error

(c) Truncation error

(d) Absolute error

(ii) If a number is rounded to n decimal places, then the absolute error is :

(a) $\frac{1}{2}10^{-n}$

(b) $\frac{1}{3}10^{-n}$

(c) $\frac{1}{4}10^{-n}$

(d) 10^{-n}

(iii) The order of convergence in Newton-Raphson method is :

(a) 0

(b) 1

(c) 2

(d) 3

(iv) Newton's interative formula to find $\sqrt{N}$ is :

(a) $x_{n+1} = x_n(2 - Nx_n)$

(b) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$

(c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{1}{Nx_n}\right)$

(d) None of these

(v) The first term of the series whose second and subsequent terms are 8, 3, 0, –1, 0 is ..... .

(vi) As soon as a new value of a variable is found by iteration; it is used immediately in the following equations, this method is :

(a) Gauss-Jordon method

(b) Gauss-Seidal method

(c) Jacobi's method

(d) Relaxation method

(vii) The binary equivalent of the decimal number 11.625 is ..... .

(viii) (0,4273E – 2) + (0.5324E – 3) = ...

(ix) By Trapezoidal rule :

$$\int_a^b f(x)dx = \text{.....}$$

(x) Using forward differences, the formula for $f'(a)$ = ... 1×10=10

Short Answer Type Questions

(B) Answer all the *four* questions.

(i) If $z = \frac{1}{8}xy^3$, find the percentage error in z when $x = 3.14 \pm 0.0016$ and $y = 4.5 \pm 0.05$.

(ii) Express $3x^3 - 4x^2 + 3x - 11$, in factorial notation.

(iii) Derive Simpson's $\frac{3}{8}$rd rule using Newton-Cote's quadrature formula.

(iv) With the usual notations derive the identity, $\delta = E^{1/2} - E^{-1/2}$. 4×5=20

Section–B

2. (a) Convert $(1101101)_2$ into decimal form.

   (b) Divide 0.6663E8 by 0.2000E5 and write the result in correct format. 5,5

3. (a) Round off the number 865250 to four significant figures and compute the percentage error.

   (b) If $u = 3v^7 - 6v$, find the relative error in u at $v = 1$ if the error in $v = 0.05$. 5,5

Section–C

4. (a) Find root of $f(x) = \sqrt{5}$ using Bisection method.

   (b) Using Regula-Falsi method obtain approximate solution of the equation $x^3 - 5x - 3 = 0$. 5,5

5. (a) Solve the following equations by Guass-elimination method :

$$2x + 4y + 2z = 15,$$

$$2x + y + 2z = -5$$

and

$$4x + y - 2z = 0.$$

(b) Solve by Gauss-Jordon elimination method :

$$2x + 6y + z = -14$$

$$5x - y + 2z = 29,$$

$$-3x - 4y + z = 4$$ 5,5

Section–D

6. (a) Construct the table of differences for the data :

x	0	1	2	3	4
$f(x)$	1.0	1.5	2.2	3.1	4.6

and evaluate $\Delta^3 f(2)$.

(b) If $u_0 = 3$, $u_1 = 12$, $u_2 = 81$, $u_3 = 2000$, $u_4 = 100$, then calculate $\Delta^4 u_0$. 5,5

7. (a) Using Newton's forward interpolation formula, estimate the number of students who obtained marks between 40 and 45, using data :

Marks	No. of Students
30–40	31
40–50	42
50–60	51
60–70	35
70–80	31

(b) Interpolate by means of Gauss's Backward formula the population of a town for the year 1974, given that :

Year	Population (in thousands)
1939	12
1949	15
1959	20
1969	27
1979	39
1989	52

5,5

Section–E

8. (a) Evaluate :

$$\int_0^6 \frac{dx}{1+x^2}$$

by using Simpson's $\frac{1}{3}$rd rule.

(b) Use Trapezoidal rule to evaluate $\int_0^1 x^3 dx$ considering five sub-intervals. 5,5

9. (a) 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 $x = 1.1$.

(b) The function $y = 3xe^{-x}$ is tabulated below : (3, 0.4481), (4, 0.2198) and (5, 0.1011). Find $\frac{dy}{dx}$ at $x = 3$, 4 and 5 and compare your results with the exact values. 5,5