

Total No. of Questions : 9]  
(1047)

Roll No. ....

[Total No. of Printed Pages : 4

**BCA (CBCS) RUSA VITH Semester  
Examination**

**3768**

**NUMERIAL METHODS**

Paper : BCA0602

**Time : 3 Hours]**

**[Maximum Marks : 50**

**Note :-** Attempt *five* questions in all, selecting *one* question each from Units I, II, III and IV. Q. No. 9 in Unit-V is compulsory. All questions are of equal marks.

**Unit-I**

1. (a) Given that  $u = \frac{5xy^2}{z^3}$  find the relative error at

$x = y = z = 1$  when the errors in each of  $x, y,$

$z$  is 0.001.

5

**C-547**

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Turn Over

- (b) The Maclaurin expansion of  $\sin x$  is given by :

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots,$$

where  $x$  is in radians. Use the series to compute the value of  $\sin 25^\circ$  to an accuracy of 0.001. 5

2. (a) Evaluate the sum  $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$  correct to four significant figures and find its absolute and relative errors. 5

- (b) Convert the following binary fractions to decimal fractions :

$$(0.1100011)_2 \text{ and } (0.11111111)_2. \quad 5$$

### Unit-II

3. (a) Find the positive root, between 0 and 1, of the equation  $x = e^{-x}$  to a tolerance of 0.05%. 4

- (b) Solve  $x^4 - 5x^3 + 20x^2 - 40x + 60 = 0$ , by Newton-Raphson method given that all the roots of the given equation are complex. 6

4. Solve the system  $2x + y + z = 10$ ,  $3x + 2y + 3z = 18$ ,  $x + 4y + 9z = 16$  using both Gauss elimination and Gauss-Jordan methods. 10

### Unit-III

5. (a) Prove that  $e^x = \frac{\Delta^2}{E} e^x \cdot \frac{Ee^x}{\Delta^2 e^x}$ , the interval of differencing being  $h$ . 5

- (b) Find the missing term in the following table :

$x$	0	1	2	3	4	
$y$	1	3	9	...	81	5

Explain, why result differs from  $3^3 = 27$ .

6. (a) Given that :

$$\sqrt{12500} = 111.8034, \sqrt{12510} = 111.8481,$$

$$\sqrt{12520} = 111.8928, \sqrt{12530} = 111.9375.$$

Find the value of  $\sqrt{12516}$  using Newton's forward interpolation formula. 5

- (b) Apply the Gauss's backward interpolation formula and find the population of a town in 1946, with the help of the following data :

Year	1931	1941	1951	1961	1971
Population	15	20	27	39	52

(in Thousands) 5

### Unit-IV

7. (a) A cubic function  $y = f(x)$  satisfies the following data :

$x$	0	1	3	4
$f(x)$	1	4	40	85

Determine  $f(x)$  and hence find  $f'(2)$  and  $f''(2)$ . 5

- (b) The function  $y = 3xe^{-x}$  is tabulated below :  
 (3,0.4481), (4,0.2198), (5,0.1011).

Find  $y'(x)$  at  $x = 3, 4$  and  $5$  and compare your results with the exact values.

5

8. (a) Derive Simpson's 3/8 rule and using this rule

evaluate  $\int_0^1 \frac{1}{1+x} dx$  with  $h = \frac{1}{6}$ .

5

- (b) Compute the integral  $\int_0^{\pi/2} \sqrt{1-0.162 \sin^2 x} dx$   
 by Weddle's rule.

5

### Unit-V

9. (a) Calculate the value of  $\sqrt{102} - \sqrt{101}$  correct to four significant figures.

- (b) Define absolute and relative errors.

- (c) Apply Newton-Raphson method to find  $\sqrt[3]{x}$ ,  $x > 0$ .

- (d) Prove that  $\mu = \sqrt{1 + \frac{\delta^2}{4}}$ .

- (e) For what values of  $\alpha$  and  $\beta$ , the quadrature formula  $\int_{-1}^1 f(x) dx \approx \alpha f(-1) + \beta f(\beta)$  is exact for all polynomials of degree less than or equal to 1.

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