Roll No. .....

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

(1048)

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

4038

NUMERIAL METHODS

Paper : BCA0602

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 Section A is compulsory.

Section–A

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

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

(a) 2

(b) 3

(c) 0

(d) None of these

(ii) Which of the following relation is false ?

(a) $E = 1 + \Delta$

(b) $E^{-1} = 1 - \nabla$

(c) $\nabla^2 = 1 - 2E + E^{-2}$

(d) None of these

(iii) In Gauss-elimination method for solving a system of linear algebraic equations, triangularization leads to :

(a) Diagonal matrix

(b) Lower triangular matrix

(c) Upper triangular matrix

(d) Singular matrix

(iv) Which of the following methods always converges to root of equation $f(x) = 0$?

(a) Newton-Raphson method

(b) Regula-Falsi method

(c) Secant method

(d) None of these

(v) By Simpson's (1/3)– rule, the value of $\int_1^7 \frac{1}{x} dx$ is :

(a) 1.358

(b) 1.958

(c) 1.625

(d) 1.458

(vi) The Gauss-Seidal method gives results faster when the pivotal elements are :

(a) Smaller than other coefficients

(b) Larger than other coefficients

(c) Equal to other coefficients

(d) None of these

(vii) The value of $\Delta^2 x^3$ at $x = 0$, is .....

(viii) (0.735816E4) + (0.635742E4) = ...

(ix) (0.999658E–3) – (0.994576E–3) = ...

(x) The first term of the series whose second and subsequent terms are 8, 3, 0, –1, 0 is ..... . (1×10=10)

Short answer type questions :

(B) Answer all *four* questions. Each question carries 5 marks.

(i) Evaluate the sum $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$ to four significant digits and find relative error.

(ii) Find the root of the equation $e^4 = 4x$, which is approximately 2, correct to three places of decimals.

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

(iv) Derive Simpson's 1/3–rule using method of undetermined coefficients. (4×5=20)

Section–B

2. (a) Given $f(x) = \sin x$, construct the Taylor series approximations of order 0 to 7 at $x = \frac{\pi}{3}$ and state their absolute errors. (5)

(b) If $z = \frac{1}{8}xy^3$, find the percentage error in z when $x = 3.14 \pm 0.0016$ and $y = 4.5 \pm 0.05$. (5)

3. (a) If $p = 3c^6 - 6c^2$, find the percentage error in p at $c = 1$, if the error in c is 0.005. (5)

(b) Convert the following binary numbers to decimal form :

$(100101)_2$ and $(10000001)_2$. (5)

Section–C

4. (a) Find a root of the equation $4e^{-x} \sin x - 1 = 0$ by Regula-Falsi method given that the root lies between 0 and 0.5. (5)

(b) Find the roots of the equation $\sin x = 1 + x^3$, between -2 and -1 correct to three decimal place by Newton-Raphson method. (5)

5. Solve the system $6x + y + z = 20$, $3x + 4y - z = 6$, $x - y + 5z = 7$ using both Jacobi and Gauss-Seidel methods. (10)

Section–D

6. (a) Using the method of separation of symbols, show that $\Delta^n u_{x-n} = u_x - nu_{x-1} + \frac{n(n-1)}{2} u_{x-2} + ... + (-1)^n u_{x-n}$. (5)

(b) Using Newton forward difference formula, find the sum

$$S_n = 1^3 + 2^3 + ... + n^3.$$ (5)

7. (a) From the following table, find the value of $e^{1.17}$ using Gauss's forward formula : (5)

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

(b) In an examination the number of candidates who obtained marks between certain limits were as follows :

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

Find the number of candidates whose scores lie between 45 and 50. (5)

Section–E

8. (a) From the following values of x and $y = f(x)$:

x	0.4	0.5	0.6	0.7	0.8
$f(x)$	1.5836	1.7974	2.0442	2.3275	2.6511

Find $\frac{dy}{dx}$ at $x = 0.6$. (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)

9. (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)