#### **Raniganj Girls' College**

## **Department of Mathematics**

# 6<sup>TH</sup> SEMESTER B.SC. UG Examination

## **6**<sup>TH</sup> Semester(Honours)

#### Subject: MATHEMATICS

#### Paper Name: NUMERICAL ANALYSIS

#### Paper Code: BSCHMTMC601

#### Full Marks: 40

#### Time: 2 hours

Q.No 1.	Answer any <b>five</b> questions from the following:	Marks 5X1=5
(a)	Round-off the following numbers to three significant figures: 0.01201, -239.85	
(b)	Prove that $\Delta . \nabla = \Delta - \nabla$	
(c) (d)	Define the shift operator $E^{-1}$ . What is polynomial interpolation?	
(e)	Suppose that $f(x)$ is a polynomial of first degree. What is the error of computing $\int_{a}^{b} f(x) dx$ by	
(f)	Trapezoidal Rule?	
(g)	What is pivoting?	
(h)	What is Transcendental equation? Give an example.	
	If $\Delta r = \Delta h = 0.001$ find the absolute error in $v = \frac{1}{3}\pi r^2 h$ , where $r = 2$ and $h = 3$ .	
2.	Answer any five questions from the following:	
		5X2=10
(a)	If a number 0.000012 is approximated to 0.000009 find the number of significant digits for such approximation.	
(b)	Subtract 203.176 from 791.23	
(c)	Calculate $\Delta^2(ax^2 + bx + c)$ .	
(d)	What is meant by the degree of precision of a quadrature formula?	
(e)	State geometrical significance of Trapezoidal rule for numerical integration.	

- (f) Comment on accuracy of Euler's method in solving differential equations.
- (g) What is rate/order of convergence of iterative method?
- (h) What is LU-factorization method?

Q.No

- Marks
- 3. Answer any three questions from the following: (a) Find the relative error in computing  $f(x) = x^2 - 5x$  for  $x = \sqrt{3}$  taking  $\sqrt{3} = 1.73$
- (b) Using N-R method, calculate  $2^{\frac{1}{5}}$  correct up to three significant figures.
- (c) What is the lowest degree polynomial which takes the following values:

x	0	1	2	3	4	5
f(x)	1	4	9	16	25	36

(d) Find approximate value of  $\int_{1}^{2} \frac{1}{x} dx$  by Simpson's one third rule taking 4 Sub-intervals.

(e) Find by Euler's method, the value of y for x = 0.3 from the differential equation  $\frac{dy}{dx} = \frac{y - x}{y + x}$ . Given that y = 1 when x = 0 taking step length 0.1.

4. Answer any three questions from the following:

(a)(i) Prove that  $\Delta^k f(x) = \sum_{i=0}^k (-1)^i \binom{k}{i} f(x-ih)$  hence deduce  $\Delta^k y_n = \sum_{i=0}^k (-1)^i \binom{k}{i} y_{n-i}$  (4+1)

(ii) If 
$$f(x) = \frac{1}{x^2}$$
 find the divided difference  $f(a,b)$ ;  $f(a,b,c)$  and  $f(a,b,c,d)$ . 5

(b)

Find the quadrature formula in the form  $\int_{0}^{1} \frac{f(x)dx}{\sqrt{x(1-x)}} = \alpha_1 f(0) + \alpha_2 f(\frac{1}{2}) + \alpha_3 f(1)$  which is exact 10 for polynomial of highest possible degree. Then using the formula, evaluate the following

for polynomial of highest possible degree. Then using the formula, evaluate the following integral  $\int_{0}^{1} \frac{dx}{\sqrt{x-x^3}}$ .

Solve the following system of equations (c)(i)

 $x_1 + x_2 + x_3 = 6$ ;  $3x_1 + (3 + \varepsilon)x_2 + 4x_3 = 20$ ;  $2x_1 + x_2 + 3x_3 = 13$  Using the Gauss elimination method where  $\varepsilon$  is small such that  $1 \pm \varepsilon^2 = 1$ .

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1X10=10

### (ii) Discuss the convergence of Regular-Falsi Method.