

**P.R.GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA**  
**III B.SC MATHEMATICS Syllabus for V Semester, Paper IV(A)**  
**(Elective-1) Numerical Analysis**

Total Hrs. of Teaching-Learning: 45 @ 3 h / Week

Total Credits: 03

**Objective:** To find the approximate Polynomial for the given data when the data is even or uneven by using interpolation, also we can find the differentiation even if the function is not known explicitly.

To find the solution of Algebraic and Transcendental equations using Bisection, Falsi Position, Iteration and Newton Raphson methods.

**Module I**

**Unit I: Finite Differences**

(7 hours)

- (a) Forward, Backward and central difference operators
- (b) Shift and average difference operators, relation between the operators.

**Unit II: Interpolation**

(20 hrs)

- (a) Interpolation for equal intervals: Newton's forward, backward, Gauss forward, Backward, Strilling's.
- (b) Interpolation for unequal intervals: Lagrange's interpolation formula for unequal intervals, divided differences, Newton's divided difference.

**Module II**

**Unit III: Numerical Differentiation**

(8 hours)

- (a) Numerical Differentiation using Newton's forward & backward formulae
- (b) Derivatives using central difference formula, maxima & minima.

**Unit IV: Solutions of Algebraic and transcendental equations**

(10 hours)

Bisection Method (b) Iteration Method

- (c) Method of false position (d) Newton Raphson Method

**Prescribed Text books:**

Numerical Analysis by S. Ranganatham, MVSSN Prasad, Dr. V. Ramesh Babu.  
S. Chand & Company

**Reference books:**

Numerical Analysis by S.S.Sastry Prentice Hall, NewDelhi  
Numerical Analysis by Kamali Surya Narayana, Schand&co, NewDelhi  
Numerical Analysis by Gupta &Malik, Krishna Prakashan media (P) Ltd Meerut"

**QUESTION PAPER PATTERN, SEMESTER-V**  
**PAPER –IV, Elective 1**

| Module    | TOPIC                                                        | V.S.A.Q | S.A.Q<br>(including<br>choice) | E.Q<br>(including<br>choice) | Marks<br>Allotted |
|-----------|--------------------------------------------------------------|---------|--------------------------------|------------------------------|-------------------|
| Module-I  | Finite Differences                                           | 02      | 02                             |                              | 12                |
|           | Interpolation                                                | 02      | 03                             | 03                           | 41                |
| Module-II | Numerical<br>Differentiation                                 | 02      | 02                             | 01                           | 20                |
|           | Solutions of<br>Algebraic and<br>transcendental<br>equations | 02      | 03                             | 02                           | 33                |
| Total     |                                                              | 08      | 10                             | 06                           |                   |

V.S.A.Q. = Very Short answer questions (1mark)

S.A.Q.= Short answer questions ( 5 marks)

E.Q. = Essay questions ( 8 marks)

Very Short answer questions :  $8 \times 1M = 08$

Short answer questions :  $6 \times 5M = 30$

Essay questions :  $4 \times 8M = 32$

Total Marks:

70

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**P.R.GOV.T.COLLEGE (AUTONOMOUS), KAKINADA**  
**III Year B.Sc. Degree Examinations V Semester MATHEMATICS IV**  
**Course(Elective 1) Numerical Analysis**  
**MODEL PAPER (w.e.f.2016-17)**

Time:3hours

Max marks=70M

**PART-I**

Answer all the questions. Each question carries 1 mark

8X1=8M

1. Prove that  $\Delta=E-1$ .
2. Prove that  $\mu^2=1+\frac{1}{4}\delta^2$
3. Define Shift operator.
4. Write Gauss forward interpolation formula.
5. Write the formula for  $\frac{dy}{dx}$  at  $x=x_1$
6. Write the convergent condition for iterative method.
7. Define algebraic equation.
8. Write the formula for Newton Raphson method.

**PART-II**

Answer any three questions from each section.

6X5=30M

**SECTION A**

9. Prove that  $(\frac{\Delta^2}{E})e^x \cdot (\frac{Ee^x}{\Delta^2 e^x}) = e^x$ , the interval of differencing being unit
10. Find the missing term in the following data given below

|   |   |   |   |   |    |
|---|---|---|---|---|----|
| x | 0 | 1 | 2 | 3 | 4  |
| y | 1 | 3 | 9 | - | 81 |

11. Derive Newton's forward interpolation formula

12. Apply Stirling formula to find the value of  $f(1.22)$  from

|      |   |       |       |       |       |
|------|---|-------|-------|-------|-------|
| X    | 0 | 0.5   | 1.0   | 1.5   | 2.0   |
| f(x) | 0 | 0.191 | 0.341 | 0.433 | 0.477 |

13. Using Lagrange's interpolation formula find the value of y corresponding to  $x=10$  from the following table

|   |    |    |    |    |
|---|----|----|----|----|
| X | 5  | 6  | 9  | 11 |
| Y | 12 | 13 | 14 | 16 |

#### SECTION B

14. Use Newton backward interpolation formula to derive  $\frac{dy}{dx}$  at  $x=x_n$

15. From the following table, find x correct to 4 decimal places for which y is minimum and find this value of y

|   |        |        |        |        |
|---|--------|--------|--------|--------|
| X | 0.60   | 0.65   | 0.70   | 0.75   |
| Y | 0.6221 | 0.6155 | 0.6138 | 0.6170 |

16. Explain Bisection Method.

17. Solve the equation  $\sin x = 5x - 2$  by iteration method.

18. Find an approximate root of  $x^3 - x - 1 = 0$ .

#### PART-III

Answer any four questions by choosing at least one from each section

4X8=32M

#### SECTION-C

19. Using Newton's Forward interpolation formula, find the value of  $f(x)$  when  $x=1.4$

|   |      |      |      |      |      |
|---|------|------|------|------|------|
| X | 1.1  | 1.3  | 1.5  | 1.7  | 1.9  |
| Y | 0.21 | 0.69 | 1.25 | 1.89 | 2.61 |

20. Find  $\sqrt{12516}$  using Gauss backward interpolation formula given that  $\sqrt{12500} = 111.8033$ ;

$\sqrt{12510} = 111.8481$ ;  $\sqrt{12520} = 111.8928$  and  $\sqrt{12530} = 111.9374$ .

21. Newton's divided difference formula Find the values of  $f(8)$  from the following table

|      |    |     |     |     |      |      |
|------|----|-----|-----|-----|------|------|
| X    | 4  | 5   | 7   | 10  | 11   | 13   |
| f(x) | 48 | 100 | 294 | 900 | 1210 | 2028 |

#### SECTION-D

22. Form the following table of values of x and y, obtain  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  for  $x=1.5$

|   |       |     |        |      |        |      |
|---|-------|-----|--------|------|--------|------|
| X | 1.5   | 2.0 | 2.5    | 3.0  | 3.5    | 4.0  |
| Y | 3.375 | 7.0 | 13.625 | 24.0 | 38.875 | 59.0 |

23. Solve  $x^3 - 2x - 5 = 0$  by False position method.

24. Find the root of the equation  $f(x) = e^x - 3x$  using Newton-Raphson method.

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