

P. R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III B.SC MATHEMATICS – Semester VI (w.e.f. 2018-19)

Course (Elective - VII (B)): Numerical Analysis

Total Hrs. of Teaching, Learning and Evaluation: 75 @ 5 h / Week

Total Credits: 05

Objective:

- To find the different types of errors in computation and then to reduce the errors.
 - 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, False Position, Iteration and Newton Raphson methods.
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Unit - I: Errors in Numerical Computation

(12 hrs)

Errors and their accuracy, Mathematical preliminaries, Errors and their analysis, Absolute, Relative and Percentage errors, A general error formula.

Unit - II: Solutions of Algebraic and transcendental equations

(12 hrs)

Bisection Method, Iteration Method, Method of false position, Newton Raphson Method, Generalised Newton Raphson method, Muller's method.

Unit - III: Interpolation – I

(12 hrs)

Errors in polynomial interpolation, Finite Differences, Forward, Backward and central difference operators, Shift and average difference operators, Symbolic relation between the operators, Detection of errors by use of difference tables, Differences of a polynomial.

Unit - IV: Interpolation - II

(12 hrs)

Interpolation for equal intervals: Newton's forward, backward, Gauss forward, Backward, Stirling's, Bessel's and Everette's formulae.

Unit - V: Interpolation – III

(12 hrs)

Interpolation for uneven intervals: Lagrange's interpolation formula, Error in Lagrange's Interpolation, Divided differences and their properties, Relation between divided differences formula, Forward, Backward and central difference operators, Newton's divided differences, Inverse Interpolation.

Co-Curricular: Assignment, Seminar, Quiz, etc.

(15 Hrs)

Prescribed Text books:

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

Reference books:

1. Numerical Analysis by S. S. Sastry, Prentice Hall, New Delhi.
2. Numerical Analysis by Kamali Surya Narayana, S. Chand & co, New Delhi.
3. Numerical Analysis by Gupta & Malik, Krishna Prakashan media (P) Ltd, Meerut.

BLUE PRINT FOR QUESTION PAPER PATTERN
SEMESTER-VI
PAPER – VII : ELECTIVE VII (B)

UNIT	TOPIC	V.S.A.Q	S.A.Q (including choice)	E.Q (including choice)	Marks Allotted
I	Errors in Numerical Computations	01	01	01	14
II	Solutions of Algebraic and transcendental equations	01	01	02	22
III	Interpolation – I	01	01	02	22
IV	Interpolation – II	01	01	02	22
V	Interpolation – III	01	01	01	14
Total		05	05	08	94

V.S.A.Q. = Very Short answer questions (1 mark)
S.A.Q. = Short answer questions (5 marks)
E.Q. = Essay questions (8 marks)

Very Short answer questions : 5 x 1 M = 05
Short answer questions : 3 x 5 M = 15
Essay questions : 5 x 8 M = 40

Total Marks : _____ = 60

P.R. Government College (Autonomous), Kakinada
III year B.Sc. Degree Examinations : VI Semester - Mathematics
Course (Elective VII (B)) : Numerical Analysis
Paper VII: MODEL PAPER (w.e.f. 2019-20)

Time: 2 Hrs 30 Min

Max. Marks : 60 M

PART – I

Answer ALL the following questions. Each question carries 1 mark.

5 x 1 = 5 M

1. Estimate $1/3$ to three significant digits and find its absolute error.
2. Write the formula for Newton - Raphson method to find the approximate root.
3. Define Shift operator.
4. Write the Bessel's Formula for interpolation
5. Write the divided difference of $f(x) = x^2 - 5$ for the arguments 2 and 4.

PART –II

Answer any THREE of the following questions. Each question carries 5 marks.

3 x 5 = 15 M

6. Define absolute, relative and percentage errors and give an example.
7. Find a root of the equation $x^3 - 2x - 5 = 0$ by using Newton-Raphson method.
8. Find the missing term in the following data given below.

X	0	1	2	3	4
Y	1	3	9	-	81

9. Derive Newton's backward interpolation formula.
10. Using the inverse Lagrange's interpolation formula, if $y_1 = 4$, $y_3 = 12$, $y_4 = 19$, $y_x = 7$, then find the value of x .

PART –III

Answer any FIVE questions from the following by choosing at least TWO from each section. Each question carries 8 marks.

5 X 8 = 40 M

SECTION – A

11. If $u = 4x^2y^3/z^4$ and errors in x, y, z be 0.001, compute the relative maximum error in u , when $x = y = z = 1$.
12. Find the real root of the equation $x^3 - 9x + 1 = 0$ by using Regula Falsi Method.
13. Find the root of the equation $f(x) = e^x - 3x = 0$ by using Newton-Raphson method.
14. (1) Prove that $\mu^2 = 1 + \frac{\delta^2}{2}$ and $\Delta = \frac{\delta^2}{2} + \delta \sqrt{1 + \frac{\delta^2}{4}}$
(2) Find the missing term in the following table:

x	1	2	3	4	5	6	7	8
y	1	8	-	64	-	216	343	512

SECTION – B

15. Prove that (i) $\mu^2 = 1 + \frac{\delta^2}{4}$, (ii) $\Delta = \frac{\delta^2}{2} + \delta \sqrt{1 + \frac{\delta^2}{4}}$

(iii) $\nabla = 1 - e^{-hD}$ and (iv) $\Delta - \nabla = \delta^2$.

16. 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

17. Apply Stirling's formula to find the value of $f(1.22)$ from the following table.

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

18. By means of Newton's divided difference formula, find the value $f(8)$ and $f(15)$ from the following table.

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