

P.R.GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc. MATHEMATICS - VI Semester (w.e.f.2018-19)
Course (Cluster VIII (B)-I) Advanced Numerical Analysis

Total hours of teaching: 75 @ 5 hours/ week

Total credits: 0 5

Objective:

- To find the integration and solutions for ordinary differential equations using numerical methods.
- To find the best fitted curve for the given data.

Unit – I : Curve Fitting

(15 hrs)

Least – Squares Curve Fitting Procedures, Fitting a Straight Line, Nonlinear Curve Fitting, Curve Fitting by a Sum of Exponentials.

UNIT - II : Numerical Differentiation

(15 hrs)

Derivatives using Newton's forward difference formula, Newton's backward difference formula, Derivatives using central difference formula, Stirling's interpolation formula, Newton's divided difference formula, Maximum and minimum values of a tabulated function.

UNIT- III : Numerical Integration

(15 hrs)

General quadrature formula on errors, Trapezoidal rule, Simpson's $1/3$ – rule, Simpson's $3/8$ – rule, and Weddle's rules, Euler – Maclaurin Formula of summation and quadrature, The Euler transformation.

UNIT – IV : Solutions of Simultaneous Linear Systems of Equations

(15 hrs)

Solution of linear systems – Direct methods: Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method, Method of factorization, Solution of Tridiagonal Systems, Iterative methods: Jacobi's method, Gauss- sieidal method.

UNIT – V : Numerical solution of ordinary differential equations

(15 hrs)

Introduction, Solution by Taylor's Series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge – Kutta methods.

Reference Books :

1. Numerical Analysis by S.S. Sastry, Published by Prentice Hall India (Latest Edition).
2. Numerical Analysis by G. Sankar Rao, published by New Age International Publishers, New Hyderabad.
3. Finite Differences and Numerical Analysis by H.C. Saxena published by S.Chand and Company, Pvt. Ltd., New Delhi.
4. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.

BLUE PRINT FOR QUESTION PAPER PATTERN

SEMESTER-VI

PAPER VIII (B) 1, CLUSTER VIII (B) 1

UNIT	TOPIC	V.S.A.Q	S.A.Q(including choice)	E.Q(including choice)	Total Marks
I	Curve Fitting	01	01	01	14
II	Numerical Differentiation	01	01	01	14
III	Numerical Integration	01	01	02	22
IV	Solution of Linear System of Equations	01	01	02	22
V	Numerical Solutions for ODE	01	01	02	22
TOTAL		05	05	08	94

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

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

Total Marks : _____ = 60

P.R. Govt. College (Autonomous), Kakinada
III B.Sc. Examination - VI Semester - Mathematics
(Cluster - VIII (B)-1) Advanced Numerical Analysis
PAPER-VIII (B) -1 MODEL PAPER (W.e.f. 2019-20)

Time: 2 hrs 30 Min

Max. Marks : 60M

PART - I

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

5 x 1 = 5 M

1. Write the normal equations for fitting a straight line.
2. Write the formula for $\frac{dy}{dx}$ at $x = x_1$.
3. Write Simpson's 3/8 formula.
4. Write the formula A^{-1} for a non singular matrix A.
5. Write Euler's formula for y_n

PART - II

Answer any THREE of the following questions. Each question carries 5 marks. 3 x 5 = 15 M

6. *Fit a straight line* Find the least square line $y = a + bx$ for the data.

x_i	1	2	3	4	5
y_i	14	27	40	55	68

7. 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

8. Evaluate $\int_0^1 x^3 dx$ with five sub-intervals by Trapezoidal rule.
9. Solve the equation $x + y + z = 6$; $3x + 3y + 4z = 20$; $2x + y + 3z = 13$ using Gaussian elimination method.
10. Solve $\frac{dy}{dx} = x + y$, $y(0) = 1$ using Picard's method upto 3 approximations.

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. Fit a second degree polynomial to the following data by the method of least squares.

X	0	1	2	3	4
Y	1	1.8	1.3	2.5	6.3

12. 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

13. Evaluate the $\int_0^{5.2} \log x dx$ using Weddle's Rule.

14. Derive Newton's general quadrature formula.

SECTION - B

15. Solve the equations $2x + 3y + z = 9$; $x + 2y + 3z = 6$; $3x + y + 2z = 8$ by factorization method.

16. Solve the following equations by Gauss-Seidel method

$$8x - 3y + 2z = 20; 4x + 11y - z = 33; 6x + 3y + 12z = 35;$$

17. Given $\frac{dy}{dx} = -xy^2$, $y(0) = 2$, compute $y(0.2)$ in steps of 0.1 using modified Euler's method.

18. Obtain the values of y at x=0.1,0.2 using Runge-kutta method of fourth order for the differential equation $y' + y = 0$, $y(0) = 1$