P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc. MATHEMATICS - VI Semester (w.e.f.2018-19)
Course (Cluster VIII (B)-1) Advanced Numerical Analysis

Total hours of teaching: 45 @ 3 hours / week **Total credits: 3**

Objective:

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

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Unit – I Curve Fitting: **(8 hrs)**

Least – Squares curve fitting procedures, fitting a straight line, nonlinear curve fitting, Curve fitting by a sum of exponentials.

UNIT-II Numerical Differentiation: **(6 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: **(10 hrs)**

General quadrature formula on errors, Trapozoidal 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: **(11 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- siedal method.

UNIT–V Numerical solution of ordinary differential equations: **(10 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	02	01	19
II	Numerical Differentiation	01	01	01	14
III	Numerical Integration	02	02	01	20
IV	Solution of Linear System of Equations	02	03	01	25
V	Numerical Solutions for ODE	02	02	02	28
TOTAL		08	10	06	106

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 : 4x8M =32
Short answer questions : 5x6M =30
Very Short answer questions : 8x1M =08

Total Marks : 70

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. 2018-19)

Time: 3 hours **Max marks=70M**

PART-I

Answer all the questions. Each question carries 1 mark **8X1=8M**

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 Euler Transformation formula.
5. Write the formula A^{-1} for a non singular matrix A.
6. In factorization method if A=LU, then write L.
7. Write Euler's formula for y_n
8. Write the formula for Runge-Kutta method of second order

PART-II

Answer any three questions from each section **6X5=30 M**

SECTION –A

9. Find the least square line y=a+bx for the data.

Xi	1	2	3	4	5
Yi	14	27	40	55	68

10. Find the curve of best fit of the type $y=ae^{bx}$ to the following data by the method of least squares

x	1	5	7	9	12
y	10	15	12	15	21

11. From the following table, find x correct to 4 decimal plances 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

12. Evaluate $\int_0^1 x^3 dx$ with five sub-intervals by Trapezoidal rule.

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

SECTION - B

14.Solve the equation x+y+z=6;3x+3y+4z=20;2x+y+3z=13 using Gaussian elimination method.

2. Solve the following equations by Gauss-Seidel method

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

3. Solve the equations $2x_1 + x_2 + x_3 = 10$: $3x_1 + 2x_2 + 3x_3 = 18$:

$x_1 + 4x_2 + 9x_3 = 16$: Using Matrix inversion method.

4. Solve $\frac{dy}{dx} = x + y, y(0) = 1$, using Picard's method upto 3 approximations.

5. Using Euler's method solve for y at x=2 from $\frac{dy}{dx} = 3x^2 + 1, y(1) = 2$,

taking step size h=0.25

PART-III

Answer any four questions by choosing at least one question from each section. 4X8=32 M

SECTION-C

19. 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

20. 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

21. Derive Newton's general quadrature formula.

SECTION -D

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

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

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