P.R.GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc. MATHEMATICS

(Elective-1) Numerical Integration and Numerical Solution for Ordinary Differential Equations

Syllabus for VI Semester, Paper-IV

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.

Module I

Unit I: Numerical Integration **(12 hrs)**

(a) Newton general quadrature formula (b) Trapezoidal rule (c) Simpson's 1/3 rule
(d) Simpson's 3/8 rule (e) Boole's rule (f) Weddle's rule

Unit II: Curve Fitting **(08 hrs)**

(a) Using Method of least squares fitting a Straight Line, Parabola
(b) Exponential curve. 5. Power function.

Module II

Unit III: Numerical Solution of Ordinary Differential Equations **(18 hrs)**

(a) Taylor Series method (b) Euler method (c)Modified Euler method
(d) Picard's method of successive approximation (e) RungeKutta method.

Unit IV: Solutions of Simultaneous Linear System of Equations **(07 hrs)**

(a) Gauss elimination method (b) Method of Factorization
(c)Gauss Jacobi's method (d) Gauss Seidel method

Prescribed books:

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

Reference books:

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

QUESTION PAPER PATTERN, Semester-VI

MODULE	TOPIC	V.S.A.Q	S.A.Q(including choice)	E.Q(including choice)	Total Marks
MODULE-I	Numerical Integration	02	03	02	33
	Curve Fitting	02	02	O1	20
MODULE-II	Numerical Solutions for ODE	02	03	02	33
	Solution of Linear System of Equations	02	02	01	20
TOTAL		08	10	06	

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

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

13. 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

SECTION - B

14. Using Taylor's series method, solve the equation $\frac{dy}{dx} = x^2 + y^2$ for x=0.4,

given that y=0 when x=0.

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

16. 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

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

18. Solve the following equations by Gauss-Seidel method

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

PART-III

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

SECTION-C

19. Derive Newton's general quadrature formula.

20. Evaluate $\int_0^2 e^{-x^2}\,dx$ using Simpsons rule taking h=0.25

21. 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

SECTION -D

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

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

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