



Register Number:

Date:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27

M.Sc. PHYSICS - II SEMESTER

SEMESTER EXAMINATION: APRIL 2017.

PH 8215: Numerical Techniques

Time: 2.30 hours

Max Marks: 70

This paper contains 2 parts and 3 printed pages

PART – A

Answer any 5 questions. Each question carries 10 marks. (5x10=50)

1. The function $f(x)$ has exact values as shown in the table

x	1	3	5
$f(x)$	4	2	10

(a) Use Newton's forward difference interpolation formula to find the quadratic function that fits the data (There is no need to simplify your answer)

(b) Estimate the values of $f(2)$ and $f(6)$. Which of these estimates is likely to be more accurate, and why? (6+4)

2. Using Taylor series method with the first five terms in the expansion find $y(0.1)$ correct to three decimal places, Given that

$$\frac{dx}{dy} = e^x - y^2, y(0) = 1$$

3. Solve the equation $\frac{dy}{dx} = 1 - y$, using modified Euler's Method and tabulate the solutions at $x=0.1, 0.2$ and 0.3 . Given $y(0)=0$

4. Use Runge-Kutta third order method to approximate y , when $x=0.1, 0.2, 0.3, h=0.1$. Given $x=0$ when $y=1$ and $\frac{dy}{dx} = x + y$

5. (i) Derive Fourier Transform of a Time Dependent function with one example

(ii) Explain convolution Theorem

6. Compute

$$I_p = \int_0^1 \left(\frac{x^p dx}{x^3 + 10} \right) \text{ for } p=0.1$$

using (a) trapezoidal and (b) Simpson's rules with the number of points 3,5 and 9 (5+5)

7. (i) Explain: Moments of the distribution

(ii) What is mean by transformation of random variables describe with suitable example (5+5)

PART B

Answer any four questions : Each questions carries 5 marks (4x5=20)

8. (i) When can we expect faster convergence in power method

(ii) Find the dominant of eigen value and eigen vector of (1+4)

$$A = \begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

9. Fit the second degree parabola in the following data

x	1	1.5	2	2.5	3	3.5	4
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

10. Using Newton forward difference formula find the first and second derivatives of $f(x)$ at $x=3$ if

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)	3.375	7.000	13.625	24.000	38.875	59.00

11. Write the Algorithm for Integrating a tabulated Function using Trapezoidal rule and Simpson's rule

12. Solve the following system of equations using LU Decomposition method:

$$x_1 + x_2 + x_3 = 1$$

$$4x_1 + 3x_2 - x_3 = 6$$

$$3x_1 + 5x_2 + 3x_3 = 4$$

13. Probability that a student gets first division in Board examination is $\frac{1}{9}$. He has appeared in 11 class test and obtained first division in 5 of them. What is the probability that he will get a first division in the Board examination?