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 2 printed pages

PART – A

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

1. By using power method find the numerically largest (dominant) eigenvalue and eigenvector of the matrix

$$A = \begin{pmatrix} 15 & -4 & -3 \\ 10 & 12 & -6 \\ -20 & 4 & -2 \end{pmatrix}$$

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. Using Runge – Kutta method of fourth order find $y(0.1)$, $y(0.2)$ from $y' = y - x$. $y(0) = 2$ h= 0.1.

4. 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

5. Using the finite difference method find the boundary conditions $y(0.25)$, $y(0.5)$, and $y(0.75)$ Satisfying the differential equation.

$$\frac{d^2 y}{dx^2} + y = x$$, subject to the boundary conditions $y(0) = 0, y(1) = 2$

6. Explain : (i)Binomial distribution (ii) poisson distribution   (5+5)

7. State and prove Bayes' Theorem

PART B

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

8. Find the value of $\int_{0}^{\frac{\pi}{2}} \sqrt{1-0.162\sin^2 x}\ dx$ using Simpson's one third rule

9. Using Stirling's formula find the first, second derivatives of the function tabulated below at the point x=2.5

x	1.5	2.0	2.5	3.0	3.5	4.0
F(x)	3.375	7.0	13.625	24.0	38.875	59.0

10. Briefly explain Fourier Integral Theorem and what are the conditions has to be satisfied

11. State and explain The Central Limit theorem with suitable examples

12. Write the Algorithm for Linear Regression

13. (i) What do you mean by interpolation

(ii) compare Trapezoidal rule and Simpson's 1/3 rule for performing numerical integration   (2+3)