Register Number:
Date: 23-10-19

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

M.Sc. PHYSICS - I SEMESTER

SEMESTER EXAMINATION: OCTOBER 2019

PH 7318 – NUMERICAL TECHNIQUES

Time- $2\frac{1}{2}$hrs **Max Marks-70**

This paper contains TWO printed pages and one part

Answer any SEVEN. Each question carries TEN marks.

[7 x 10 = 70]

1. Derive Newton's forward difference interpolation formula. (10)
2. a) Obtain the general form of solution for the Chebyshev's equation given below
   $(1-x^2)u'' - xu'+v^2u = 0$. (5)

   b) Find y at x = 1.1 by solving using Taylor series $y' = x^2+y^2$. Given that y(1) = 2.3. (5)

3. a)Evaluate the integral $\int_{-2}^{2} \frac{t}{5+2t}$ dt using Trapezoidal rule with n =8. (8)
   b) What is the order of error in Trapezoidal rule? Give its significance. (2)

4. Using modified Euler's method find y at x = 0.1 and x=0.2 given $\frac{dy}{dx} = y - \frac{2x}{y}$, y (0) =1.

5.a) Obtain the general expression for Newton Raphson method. (4)
   b) Find the smallest positive root of the equation $xe^{-2x} = \frac{1}{2}\sin x$, correct to 3 decimal places using Newton Raphson's method. (6)

6. a) Using Gauss elimination method, obtain the values of x,y and z from the equations given below
   x+6y-z = -5 ; x+y-6z = -12 ; 3x-y-z = 4. (5)
   b) Solve the following system of equations using LU decomposition
   $x_1+x_2+x_3=1$; $4x_1+3x_2-x_3 = 6$; $3x_1+5x_2+3x_3 = 4$. (5)

7. Consider the following table

X	0.2	0.4	0.6	0.8	1.0
f(x)	0.9798622	0.9177710	0.8080348	0.6386093	0.3483735

   Find f'(0.25) using Newton's forward difference approximation and f'(0.6) using Stirling's approximation.

8. a) Find the Fourier cosine transform of
   $f(x) = e^{-2x} + 4e^{-3x}$ (5)
   b) Find the Fourier sine transform of
   $f(x) = \frac{1}{x}\, e^{-ax}$ (5)

9 a) Explain linear curve fitting by least square method. Obtain the normal equations and solve for a and b. (8)

b) What is the significance of standard deviation? (2)

10. a) What is a random variable? Explain in detail the kinds of probability distribution with adequate examples. (8)

b) Mention the important properties of binomial distribution. (2)