U.G. 4th Semester Examination - 2020

PHYSICS

[HONOURS]

Course Code : PHYS(H)CC-P-08

[PRACTICAL]

Full Marks : 20 Time : 4 Hours

Answer any **four** questions from the following: 5×4=20

1. Write an algorithm to solve the second order differential equation

$$\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=0$$

for y(0) = 0 and $y'(0)=2$ using Euler's method.

2. Write an algorithm to solve the first order differential equation

$$\frac{dy}{dx}+e^{-x}=x^2$$

for y(0) = 0 using Runge-Kutta 4th order method.

3. Write an algorithm to evaluate the integral

$$\frac{1}{\sqrt{2\pi\sigma^2}}\int e^{-\frac{(2-x)^2}{2\sigma^2}}(x+3)$$

using trapezoidal rule.

4. Write an algorithm to find Fourier coefficients of a square wave represented by the function

$$f(x)=\begin{cases}-1 & -\pi<x<0\\ 1 & 0<x<\pi\end{cases}$$

5. Write an algorithm to calculate the coefficients of linear least squares fit line for a set of data points.

6. Sine series is computed from the recurrence relation

$$\frac{(N+1)^{th}\text{ Term}}{(N)^{th}\text{ Term}}=\frac{x^2}{2n(2n+1)}$$

Write an algorithm to evaluate sin(6)

7. Write an algorithm to compute orthogonality of Legendre polynomial $P_l(x)$ which satisfies the orthonormality relation

$$\int_{-1}^{1}P_m(x)P_n(x)dx=\frac{2}{2n+1}\delta_{mn}$$

using Simpson's rule.

8. Write an algorithm to numerically evaluate the integral

$$\int_{-\infty}^{\infty}\frac{dx}{1+x^2}$$

using trapezoidal rule.

9. Write an algorithm to numerically evaluate the integral

$$\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$$

using Simpson's rule.

10. Write an algorithm to calculate n^{th} roots of unity for $n = 2; 3$ and 4.

11. Write an algorithm to compute the two square roots of $-5+12i$.

12. Write an algorithm to compute FFT of the function

$$\exp\left(-\frac{x^2}{4}\right).$$

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