Answer Script Upload Link: https://forms.gle/fKxFyPUTwQwdsnEf7

ASUTOSH COLLEGE

(Affiliated to University of Calcutta)
Semester 3- Examination
Physics-Hon's
Paper-CC5
Practical Examination
Full Marks-30
Time- 2Hrs
Attempt any one question
Programming Language: Python

1. (i) Write a python code to create a one-dimensional numpy array with 20 random numbers between [- 1, 1]. Reshape this into a (4,5) 2D array. Treat this as a 4 x 5 matrix. Transpose the matrix and take product between the two. Print the product matrix.

(ii) Using Gauss-Elimination method without refinement / rearrangement of pivot element, write down a python code to solve the following simultaneous equations:

$$9x_1 + x_2 + x_3 + x_4 = 75$$
$$x_1 + 8x_2 + x_3 + x_4 = 54$$
$$x_1 + x_2 + 7x_3 + x_4 = 43$$
$$x_1 + x_2 + x_3 + 6x_4 = 34$$

[15 +15]

2. (i) Using trapezoidal rule, write down a python code to calculate $\int_0^{\pi} \sqrt{(x)} e^x dx$ correct upto 3 significant digits. (ii) Using Simpson's one-third rule, write down a python code to calculate $\int_0^{\pi} e^{-}x^2 sin(x) dx$ correct upto 3 significant digits. (iii) What are Newton-Cote's coefficients? Mention the numerical values of them for both methods of integration.

[10+15+5]

3. (i) Write down a python code to solve the following ordinary differential equation $\frac{dy}{dx} = \frac{5x^2 - y}{e^{x+y}}$; $y(0) = 1$; $0 < x < 1$ using Runge-Kutta method for at least three different values of step size. How large domain size as well as step size you can choice to yield reasonably correct result?

(ii) Write down a python code to find the value of f(x) for x=-2.5 using Lagrange's interpolation formula using all the data points:

x	-3.5	-3.0	-2.75	-2.1	-1.9	-1.7
f(x)	-3.125	-14.0	-17.703	-22.739	-23.141	-23.087

(iii) What is the basic idea underlying Newton's forward interpolation? [15+12+3]