4th Semester (B.Sc.-H) Final Internal Examination-2020
Department of Physics
Prabhat Kumar College, Contai
Paper-C8 (Mathematical Physics III)

Group-A (Theory)
(Answer any one of the following)

1. Derive the Cauchy-Riemann equations in connection with analyticity as a function of complex variables. Find their forms in polar form also.
2. Define singularity of a function of the complex variable. Discuss various types of singularities.
3. Establish Cauchy Integral theorem. Evaluate $\oint \frac{dz}{z}$ along a closed path C (i) not encircling the origin and (ii) encircling the origin.
4. Define Fourier and Inverse Fourier transforms. Find Fourier transform of the Delta function, δ(x – a). Calculate the Fourier transform of the function f(x)cos(ax).

5. Define Symmetric and Skew-Symmetric matrices, Hermitian and Skew- Hermitian matrices. Find all eigenvalues and corresponding eigenvectors for the matrix A $= \begin{bmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$.

6. Define orthogonal and unitary matrices. Find the characteristic equation of the matrix A $= \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$. Appling the Cayley-Hamilton theorem calculate the Inverse of A.

Group-B (Practical)
(Answer any one of the following)

1. Write a program in python to find the inverse of the following matrix, A = $\begin{bmatrix} 3 & 5 & 8 \\ 4 & 6 & 9 \\ 8 & 6 & 4 \end{bmatrix}$.

2. Find the best fit straight line using least square fitting corresponding to the following data:

x	1	3	5	7	9
Y	10.7	13.1	15.2	17.6	19.9

3. Compute the value of integration $\int \sqrt{x}e^{-x}dx$ using scipy module.

4. Write a program to compute the value of resistance (R) from the five set of data of Ohm's law experiment with relevant plot.

V (Volt)	2.1	3.2	3.8	4.5	4.8
I (mA)	5.12	7.80	9.26	10.90	11.70

5. Write a program to find the solution of the three given linear equations:
3x + 2y + 4z = 7, 2x + y + z = 4; and x + 3y + 5z = 2.

6.Write a python program to solve the differential equation for radioactive decay using Euler method and plot it using Matplotlib module.

Answer script submitted to ppcontai@gmail.com