

FYUGP/2nd Sem/25(NEP)New/Pr.

2025

Four Year Under Graduate Programme (FYUGP)

2nd Semester Examination (Under NEP)

(New Session 2024-25)

PHYSICS (Major)

Paper Code : PHSMJ DC-201

(Mathematical Physics-I)

(Practical)

Full Marks : 20

Time : Four Hours

Answer any *one* question on the basis of lottery.

(LNB : 3, Viva-voce : 4, and Experiment : 10)

1. (a) Write a program to calculate simple interest (I) the principal amount (P), the rate of interest (r) and the deposited time (t) in years are manually entered.

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create a list of t (in years) within the range [1,20] and hence give the graphical representation of the principal amount P (in case of simple interest) using matplotlib module.

[Filename & given data input or import module-2, program code-3, graph-2] 6+7

2. (a) Write a program that takes the temperature in Celsius as input, converts it to Fahrenheit and prints it on the screen. Check the value for a set of data of temperature in Celsius.

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Consider a list with ten different Celsius values. Show graphically all the Celsius values into Fahrenheit using matplotlib.

[Filename & given data input-2, program code-3, graph-2] 6+7

3. (a) Write a program to calculate the compound interest (I) over any principal amount (P), given the interest rate (r) and time t .

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create an array of t (in years) within the range [1, 20] and hence give the graphical representation of the principal amount P (in case of compound interest) using matplotlib module.

[Filename & given data input or import module-2, program code-3, graph-2] 6+7

4. (a) Write a program that takes two integers as input and prints the LCM of two numbers on the screen. (Check the result at least two different set.)

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create an array x within the range [0,10] and plot $f(x) = x^2 e^{-x}$ vs x using matplotlib module.

[Filename & given data input-2, program code-3, graph-2] 6+7

5. (a) Write a program in python codes to calculate the sine value for a given angle in degrees (hence check the results at least five different angles).

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create an array x within the range $[-5, 5]$ and plot $\sin(x)$ vs x using matplotlib module.

[Filename & given data input-2, program code-3, graph-2] 6+7

6. (a) Write a program that takes the length of the three sides of a triangle as inputs and prints the area on the screen. Find the area of the triangle. (Hence the lengths are manually entered).

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create a list of x within the range $[-2, 2]$ and plot the function $f(x) = x^3 - 3x + 1$ using matplotlib module. [Filename & given data input or import module-2, program code-3, graph-2] 6+7

7. (a) A python program to accept two matrices from the keyboard and find their sum.

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create a list of t within the range $[0, 10]$ and plot the function $y = y_0 e^{-kt}$ matplotlib module (where k is constant).

[Filename & given data input or import module-2, program code-3, graph-2] 6+7

8. (a) Write a program that takes the masses of two objects and the distance between them as input and determines the gravitational force acting between them.

$$(G = 6.673 \times 10^{-11} \text{ Nm}^2.\text{kg}^{-2}).$$

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) For this problem create a list of distance r in meter within the range $[10, 2000]$ and plot gravitational force vs distance graph.

[Filename & given data input-2, program code-3, graph-2] 6+7

9. (a) Create an empty list (say A). Ask for the number of items (n) in the list as input. Then using a loop asks for n number and appends it to the list A. Create another list (say B) whose elements are square root of list A. Find the sum and average of both lists A and B and print the same on screen.

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create a list of x in range $[-1, 1]$ and show the graph e^{-x} vs x using matplotlib module.

[Filename & given data input-2, program code-3, graph-2] 6+7

10. (a) Write a program to calculate the distance between two points represented by point (x_1, y_1) and (x_2, y_2) . Check the result at least three different set of points.

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create a list of x in range $[-5, 5]$ and show the graph $\cos(x)$ vs x using matplotlib module.

[Filename & given data input or import module-2, program code-3, graph-2] 6+7

13. (a) Write a program to calculate simple interest (I) the principal amount (P), the rate of interest (r) and the deposited time (t) in years are manually entered.

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create a list of x within the range $[-5.0, 5.0]$ with step size 0.01 and hence give the graphical representation of the Gaussian function

$$f(x|\mu, \sigma) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \text{ for different values}$$

of μ and σ . [plot with same axes.]

[Filename & given data input or import module-2, program code-3, graph-2] 6+7

14. (a) Write a program that takes an integer (N) as input and find the sum of first N Natural Numbers. Check the result at least three different integers and print it.

[Filename & given data input or import module-2, program code-3, accuracy-1]

- (b) Create data-file then plot the data using matplotlib.

x	-3.00	-2.60	-2.20	-1.80	-1.40	-1.00	-0.60	-0.20	0.20	0.60
$f(x)$	0.00	0.00	0.000	0.001	0.003	0.012	0.035	0.085	0.193	0.387
x	1.00	1.400	1.80	2.20	2.60	3.00	3.40	3.80	4.20	4.60
$f(x)$	0.582	0.827	0.968	0.969	0.822	0.593	0.378	0.214	0.115	0.080
x	5.00	5.400	5.80	6.20	6.60	7.00	7.40	7.80	8.20	8.60
$f(x)$	0.093	0.144	0.232	0.347	0.482	0.654	0.764	0.822	0.809	0.754
x	9.00	9.400	9.80	10.20	10.60	11.00	11.40	11.80	12.20	12.60
$f(x)$	0.643	0.479	0.340	0.250	0.141	0.084	0.043	0.021	0.010	0.0004

[Filename & given data input or import module-2,
program code-3, graph-2]

6+7