Seat No. _____

H-003-1204001

M. Sc. (Sem.-IV) Examination

April - 2023

CT-11 : Physics

(Numerical Analysis & Comp. Programming)

(New Course)

Faculty Code : 003

Subject Code : 1204001

Time : $2\frac{1}{2}$ Hours / Total Marks : **70**

Instructions : (1) All questions carry equal marks.

(2) Attempt all questions.

1 Answer any **seven** of the following: **14**

(a) Briefly explain the meaning of interpolation and extrapolation of experimental data.

(b) List the numerical methods used to solve a set of linear equations.

(c) What are the different methods used to solve ordinary differential equations and numerical integration.

(d) Define fourier series and write a mathematical expression of fourier series.

(e) What do you mean by least square fitting of experimental data points? How it is useful?

(f) List the comparative control statements and their FORTRAN code.

(g) Briefly explain the importance of the flow chart.

(h) Define 'Computer'. What is the importance of 'Operating system'?

(i) Write names of two valid and two invalid FORTRAN integer variables.

(j) What are the different types of IF statement.

2 Answer any **two** of the following:

(a) The following table gives corresponding values of x and y. Obtain an equation of the form: $y=ax+b$, using the method of least squares. **7**

x	0	5	10	15	20	25
y	12	15	17	22	24	30

(b) Solve the given set of linear equations by direct method and Cramer's rule. **7**

$2x+5y=3xy$

$4x+8y=5xy$

(c) Define operators : Δ and E. Establish relationship between them. Find $\Delta 4x$ for the following value of u_x (i) e^x (ii) $\log x$ (iii) $x^{1/2}$. **7**

3 (a) Given the equation : $dy/dx = 2x^3 - 1$, with $y(1)=2$, estimate $y(2)$ by Euler's method using (i) h=1.0 and (ii) h=0.2. compare your result with exact solution. **7**

(b) Evaluate $\int_0^5 \frac{1}{1+x}\,dx$ by using (i) Trapezoidal rule (ii) Simpson's $1/3$ and $3/8$ rules (iii) Weddle's rule. Compare the results with the actual value. **7**

OR

(a) List the control statements. Using the flow chart explain the various logical IF statement. **7**

(b) Write the general statement for the 'Do'. What do you mean by implied 'Do' loop? Discuss the rule to be followed using 'Do' loop. **7**

4 Answer any **two** of the following:

(a) Draw the symbols and describe the function of each symbols used in flow-chart. **7**

(b) Write a FORTRAN programme to find the average value of given 100 numbers. **7**

(c) Define arthmetic expressions. Write and explain the rules for integer and real expression. **7**

5 Answer any two / Write note on any two: **14**

(a) FORMAT commands and its applications.

(b) Describe in detail, the method of generating algorithm.

(c) Discuss application of fourier series for square wave analysis : Show that square wave contains large number of high frequency components.

(d) Show how fourier series is used for expansion of Reimann-Zeta function?