Roll No. .....

DD-454

M. Sc. (Second Semester)
EXAMINATION, May/June, 2020

PHYSICS

Paper Fourth

(Computation Methods of Programming)

Time : Three Hours

Maximum Marks : 80

Note : Attempt all the *five* questions. *One* question from each Unit is compulsory. All questions carry equal marks.

Unit—I

1. (a) Assuming that root of $x^3 - 9x + 1 = 0$ lies in the interval (2, 4). Find the root by bisection method.

   (b) Using Jacobi's method, find all the eigen values and eigen vector of the matrix :

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$

Or

   (a) Explain Gaussian elimination method. Find the inverse of matrix :

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 2 & 0 \\ 3 & -1 & -4 \end{bmatrix}$$

(b) Apply Cramer's rule to solve the equation :

$$3x + y + 2z = 3$$

$$2x - 3y - z = -3$$

$$x + 2y + z = 4$$

Unit—II

2. (a) R is the resistance to motion of a train at speed V. Find a law of the type $R = a + bV^2$ connecting R and V using the following data :

V (km/ hr)	R (kg/ton)
10	8
20	10
30	15
40	21
50	30

(b) Fit a straight line to the following data :

x	y
6	5
7	5
7	4
8	5
8	4
8	3
9	4
9	3
10	3

Or

(a) Find the least squares fit of the form $y = a_0 + a_1 x^2$ to the following data :

x	y
-1	2
0	5
1	3
2	0

(b) Using Newton's backward interpolation formula, estimate the number of student who obtained mark between 40 and 45 :

Marks	No. of Students
30—40	31
40—50	42
50—60	51
60—70	35
70—80	31

Unit—III

3. (a) Evaluate :

$$\int_0^6 \frac{dx}{1+x^2}$$

by using :

(i) Trapezoidal rule

(ii) Simpson's 1/3 rule

(iii) Simpson's 3/8 rule

Or

(a) Evaluate $\int_0^2 \frac{x^2 + 2x + 1}{1 + (x+1)^4} dx$ by Gaussian 3 point formula.

(b) Find the value of y for $x = 0.1$ by Picard's method, given that :

$$\frac{dy}{dx} = \frac{y - x}{y + x}, y(0) = 1$$

Unit—IV

4. Write short notes on any *three* of the following :
   (a) Floating point arithmetic expression
   (b) Flow chart with example
   (c) Compiler and interpreter
   (d) Operating system

Unit—V

5. Discuss the following :
   (a) Executable and non-executable statement
   (b) Subroutines

Or

Write short notes on the following :

(a) Operation with Files open and close statement

(b) Overall structure of FORTRAN program.