No. of Printed Pages : 03 **Roll No. .....**

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M. Sc. EXAMINATION, 2021

(First Semester)

(C Scheme) (Main & Re-appear)

PHYSICS

PHY505C

Computational Physics

Time : 2½ *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Four* questions in all. All questions carry equal marks. Non-programmable calculator is allowed.

1. (a) Write the syntax of Function and how is it used in main program ?

(b) What is the functioning of Memory unit in computers ?

(c) What is truncation error ?

(d) Generate a central difference table by choose data of your choice.

(e) How the step size matter's in numerical integration and solving ODE ?

2. (a) Discuss in detail the basic components of computer organization.

(b) Describe the following Fortran statements with their functioning and proper syntax with suitable example :

(i) Nested IF

(ii) Do

(iii) Format.

3. (a) What is the functioning of ALU and CU units in computer ?

(b) Write a Fortran code for adding odd numbers from 1 to 100.

4. (a) Discuss the theory of iteration Method for finding the root of equation.

(b) What is principle of least square fit ? Discuss, how can we fit a data by straight line ?

5. (a) Using the Newtons-backward interpolation formula find the value of y when $x = 9$, if the following values of x and y are given :

X	:	4	6	8	10	12
Y	:	12	13	14	16	19

(b) Discuss the theory of Newton' Raphson Method for finding the root of equation.

6. (a) Discuss the theory of Taylors Series method of numerical differentiation.

(b) Using Simpson formula find the following integration :

$$\int_0^6 \frac{dx}{1+x^3}$$

7. (a) Integrate $\int_0^6 \frac{dx}{1+x^2}$ using Trapezoidal method.

(b) Discuss the theory of Taylor series method and Newton's forward difference numerical differentiation.

8. (a) Discuss the theory of Euler's method for solving differential equation.

(b) Using Taylor Series method find approximate value of y for $x = 1.2$, in steps of 0.4, if $\frac{dy}{dx} = x + y$ given that $y = 1$, where $x = 0$.

9. (a) Using Runge-Kutta forth order method find value of y when $x = 0.6$, when $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$ using $h = 0.2$.

(b) Using Euler's method $\frac{dy}{dx} = \frac{y - x}{y + x}$ with initial condition $y = 1$, at $x = 0$. Find y for $x = 0.1$ by taking step size of 0.02.