Exam. Code : 209001
Subject Code : 4765

M.Sc. Physics 1st Semester

COMPUTATIONAL TECHNIQUES

Paper—PHY-404

Time Allowed—Three Hours] [Maximum Marks—100

Note :—Attempt **FIVE** questions in all, selecting **ONE** question from each section. The **Fifth** question may be attempted from any section. Use of Scientific Calculator is allowed.

SECTION—A

1. (a) Discuss in detail the Formatted Input-Output Functions in MATLAB. 10

   (b) Write a program to plot the curve given by equation $y = \sin(x)$, as x varies from 0 to 2π. Also label the x- and y-axis and provide a suitable title to the plot. 10

2. (a) How can help be sought for various commands in MATLAB ? Describe various commands used for seeking help. 10

   (b) Write a MATLAB program to find the length of the third side and area of the triangle, if two sides a = 3.2 and b = 4.6 of triangle and angle theta = 60° between these sides. 10

SECTION—B

3. (a) Using Newton's divided difference formula, evaluate f(6) for given values :

x	5	7	11	13	21
f(x)	150	392	1452	2366	9702

10

   (b) Derive the Newton-Gregory formula for forward interpolation with equal intervals. 10

4. (a) Form the difference table of

   $f(x) = x^3 - 3x^2 + 5x + 7$ for the values of x = 0, 2, 4, 6, 8 and also compute f(10). 10

   (b) Derive the Lagrange's interpolation formula. 10

SECTION—C

5. (a) Solve by Euler's modified method of the following differential equation for x = 0.02 by taking

   $h = 0.01$, $\frac{dy}{dx} = x^2 + y$, $y = 1$ when $x = 0$.

    10

   (b) Derive Weddle's rule of numerical integration. 10

6. (a) The acceleration a(km/hr^2) of a train which starts from rest, is given at fixed intervals of time t in hours as follows :

t(hours)	0	2	4	6	8	10	12	14	16	18	20
a(km/hr^2)	0	10	18	25	29	32	20	11	5	2	0

Estimate approximately the velocity acquired by the train in 20 hours using Simpson's one-third rule. 10

(b) Explain working of second order Runge-Kutta method. 10

SECTION—D

7. (a) Compute the real root of $x^3 - 5x + 3 = 0$ in the interval [1, 2] by Regula Falsi Method by performing four iterations. 10

(b) Discuss the convergence of Newton-Raphson method in detail. 10

8. (a) Explain the working of Gauss-Elimination method. 10

(b) Find approximation to $\sqrt{3}$ correct to two decimal places using bisection method. 10