

244161

S-4239

M.Sc. (Fourth Semester)

Examination, 2024-25

PHYSICS

Paper – First

(Computational Physics)

(PHY-C-016)

Time : Two Hours]

[Maximum Marks : 60

Note : Attempt any *four* questions. All questions carry equal marks.

1. Discuss the Gauss-Elimination to solve the linear equations and solve the following equations using this method :

$$2x + 2y + 3z = 18$$

$$2x + y + z = 10$$

$$x + 4y + 9z = 16$$

$$7+8=15$$

2. Write an algorithm, draw a flow chart and write a c-program to find the roots of a quadratic equation. $3+4+8=15$

3. (a) Draw a flow chart and write a c-program to convert the decimal number to a binary number. 7

- (b) Using Do loop, draw flow chart and write a Fortran-90 program to convert degree celsius (-100 to 100) $^{\circ}\text{C}$ to Fahrenheit ($^{\circ}\text{F}$). Result should be in a table form. 8
4. (a) Write a Fortran-90 program to find the equation of straight line by least square curve fitting method. 7
- (b) Using for loop write a c-program to find the sum of cos series stability ($n = 12$)

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots \quad 8$$

5. Using Fourth order Rung-Kutta method solve the differential

equation $\frac{dy}{dx} = \frac{y^2 - 2x}{y^2 + 2x}$ for $x = 0.1, 0.2$ and 0.3 , given that

at $x = 0, y = 1$. 15

6. (a) What do you understand by eigen values and vectors? Discuss some of the important properties of eigen value and eigen vectors. 5
- (b) Find the eigen value and eigen vectors of the following matrix :

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & 4 \\ 2 & -4 & 3 \end{bmatrix}. \quad 10$$

7. Discuss Newton's-Gregory forward interpolation formula and find $f(16.4)$ using the following data by employing the forward interpolation formula :

x	16	18	20	22	24
y	26.0	29.7	33.0	37.2	4.30

7+8=15

8. (a) Write a C-program to find the intergration of the following integral using Simpson's $\frac{1}{3}$ rule :

$$\int_0^1 \frac{dx}{1+x^2}, (n=10).$$

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- (b) Find the numerical integration of above integral (given in Q.8(a)). The answer should be correct to four decimal digits.

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