

Roll No. Total No. of Printed Pages : 5

Code No. : B04-201

Fourth Semester Online Examination, May-June, 2022

M. Sc. PHYSICS

Paper II

COMPUTATIONAL METHODS & PROGRAMMING

Time : Three Hours] [Maximum Marks : 80

- Note :** • Part A and B of each question in each unit consist of very short answer type questions which are to be answered in one or two sentences.
- Part C (Short answer type) and D (Long answer type) of each question should be answered within the word limit 200-250 and 400-450.

Unit-I

- (A) Write Regula-Falsi method. 2
- (B) What is inverse of a matrix ? 2
- (C) Find a root of the equation $x^3 - 4x - 9 = 0$, using the bisection method correct to three decimal places. 4

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Or

Using iteration method, find a root of the equation $x^3 + x^2 - 1 = 0$ correct to four decimal places.

- (D) Apply Jacob's iteration method to solve the equations 12

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

Or

Using Jacobi's method, determine all the eigen values and eigen vectors of the matrix

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

Unit-II

- (A) Define differences of a polynomial. 2
- (B) What is polynomial Interpolation ? 2
- (C) Evaluate $\Delta^2 \cos 2x$. 4

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Or

Using the method of least squares, fit a curve of the form $y = \frac{x}{a+bx}$ to the following data (3, 7.148), (5, 10.231), (8, 13.509), (12, 16.434).

(D) Using Gauss backward difference formula.

Find $y(8)$ from the following data : 12

x	0	5	10	15	20	25
y	7	11	14	18	24	32

Or

Obtain the cubic spline for the following data :

x	0	1	2	3
y	2	-6	-8	2

Unit-III

- 3. (A) Write Picard's method. 2
- (B) Write general linear partial differential equation of the second order in two independent variables & also name the different classifications according to their condition. 2

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(C) Apply Runge-Kutta method to find approximate value of y for $x = 0.2$, in steps of 0.1, if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ where $x = 0$. 4

Or

Given $\frac{dy}{dx} = x^2(1+y)$ and $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.979$ evaluate $y(1.4)$ by Adams-Bashforth method.

(D) Given $y'' + xy' + y = 0$, $y(0) = 1$, $y'(0) = 0$. Obtain y for $x = 0, 0.1, 0.2, 0.3$ by any method & calculate $y(0.4)$ by using Milne's method. 12

Or

Using modified Euler's method, find and approximate value of y when $x = 0.3$, given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$.

Unit-IV

- 4. (A) What is loops ? 2
- (B) What do you mean by logical expression ? 2
- (C) What is flow chart ? Explain its types. 4

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Or

Explain real expression.

(D) Explain executable and non-executable statement.

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Or

Write a FORTRAN programe to find average height of boys and girls in a class.

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