



RAN-2103000206021006

T.Y.B.Sc. (Sem. - VI) Examination September - 2025

Physics : (Paper - XI - PH - 611)

Mathematical Methods of Physics And C-Programming

Time: 2 Hours]

[Total Marks: 50

સૂચના : / Instructions

(1)

નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.

Fill up strictly the details of signs on your answer book

Name of the Examination:

T.Y.B.Sc. (Sem. - VI)

Name of the Subject :

Physics : (Paper - XI - PH - 611)

Mathematical Methods of Physics And C-Programming

Subject Code No.: 2103000206021006

Seat No.:

--	--	--	--	--	--

Student's Signature

- (2) Draw neat diagrams wherever necessary.
- (3) Symbols used in the paper have their usual meaning.
- (4) Question 1 is compulsory and figures to the right indicate full marks of the question.

Q. 1. Answer the following questions in short: (10)

1. What regard to a differential equation, what is meant by series solution?
2. State the difference between an ordinary differential equation and a partial differential equation.
3. What do you mean by degree of a differential equation?
4. If $A = \begin{bmatrix} -1 & 2 & -3 \\ 0 & 3 & 1 \\ 2 & 1 & 4 \end{bmatrix}$ then write the transpose of matrix A.
5. If A is a 2×3 matrix and B is a 2×1 matrix, then is $A \times B$ possible? Why?
6. Give an example of a 4×3 matrix. How is this matrix declared in a C program?

7. What is the significance of declaring a variable name as representing an array?
8. What is a switch statement in C language? State its use.
9. What is the operation performed by the three logical operators !, && and || in C program?
10. Which are the two different categories of C - functions? What is the main distinction between the two categories?

Q. 2. (A) Attempt any one of the following. (07)

1. Discuss the method of separation of variables for solving a partial differential equation in the circular cylindrical coordinate system.
2. What are partial differential equations? Give examples of few commonly encountered partial differential equations in physics and discuss their significance.

(B) Attempt any one of the following. (03)

1. What do you mean by boundary conditions with reference to an ordinary differential equation and a partial differential equation? Discuss the various forms of these boundary conditions.
2. For the Legendre equation given by

$$(1-x^2) \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + n(n+1)y = 0$$
 prove that $x = +1$ is an regular singular point.

Q. 3. (A) Attempt any two of the following. (07)

1. If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ then show that multiplication of these diagonal matrices is commutative
2. Is $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & 1 & 0 \end{bmatrix}$ an orthogonal matrix? Verify it.
3. If $A = \begin{bmatrix} 1 & -1 & 1 \\ -3 & 2 & -1 \\ -2 & 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 1 & 2 & 3 \end{bmatrix}$ then prove that $A \cdot B$ is a null matrix.

(B) Attempt any one of the following. (03)

1. If two matrices A and B are given by $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ and $B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$ then calculate the direct product of A and B. Prove that $B \otimes A \neq A \otimes B$.
2. If $\sigma_1 = \begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}$, $\sigma_2 = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix}$ and $\sigma_3 = \begin{bmatrix} -3 & 1 \\ 2 & 0 \end{bmatrix}$ then prove that $\sigma_1 (\sigma_2 + \sigma_3) = \sigma_1 \sigma_2 + \sigma_1 \sigma_3$

Q. 4. (A) Attempt any one of the following. (07)

1. What is an array variable? Also write and explain a program in C to illustrate the use of arrays.
2. Explain a logical quantity and the use of a logical operator in C program. Discuss the precedence rules for logical operators giving examples.

(B) Attempt any one of the following. (03)

1. There are 25 students in a class and the marks obtained by each student in an examination are typed in one or more lines. Write a program in C that will print out the highest and the second highest marks obtained in the examination.
2. Explain in details the syntax rules for a switch statement.

Q. 5. (A) Attempt any one of the following. (07)

1. Discuss the primary merits of functions in program development. Define a function in C to divide two numbers and explain it in short.
2. Discuss the syntax rules for a C-function declaration. Also state the essential rules for defining functions.

(B) Attempt any one of the following. (03)

1. Write a program in C to define a function to reverse a given integer.
2. Write a program in C to define a function to convert degree celcius into degree fahrenheit.