

2103000206021006
EXAMINATION FEBRUARY-MARCH 2024
BACHELOR OF SCIENCE (SIXTH SEMESTER)
PHYSICS PAPER -XI (PH-611-MATHEMATICAL METHODS OF
PHYSICS AND "C" PROGRAMMING) - LEVEL 2

[Time: As Per Schedule]

[Max. Marks: 50]

Instructions:

1. Fill up strictly the following details on your answer book

- a. Name of the Examination: **BACHELOR OF SCIENCE (SIXTH SEMESTER)**
 - b. Name of the Subject: **PHYSICS PAPER -XI (PH-611-MATHEMATICAL METHODS OF PHYSICS AND "C" PROGRAMMING) - LEVEL 2**
 - c. Subject Code No: **2103000206021006**
2. Sketch neat and labelled diagram wherever necessary.
 3. Figures to the right indicate full marks of the question.
 4. All questions are compulsory.
 5. Symbols used in the paper have their usual meaning.

Seat No:

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Student's Signature

Q.1 Answer the following questions in short:

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- i. What is the order and degree of the differential equation given by
$$x^2 \left(\frac{d^2y}{dx^2}\right)^3 + y \left(\frac{dy}{dx}\right)^4 ?$$
- ii. What is a singular point? What is its classification?
- iii. What do you mean by a non – linear differential equation?
- iv. When is a matrix said to be non-singular? Is $A = \begin{bmatrix} 1 & 5 \\ 1 & 5 \end{bmatrix}$ a non-singular matrix?
- v. Define diagonal matrices giving an example.
- vi. What is an array variable.
- vii. What is a switch statement? State its use.
- viii. What is the operation performed by the three logical operators !, && and || in C program?
- ix. Which are the two different categories of C – functions? What is the main distinction between the two categories?
- x. State the main disadvantages of global variables in C – language.

Q.2 (A) Attempt any one of the following. **7**

- (i) What are partial differential equations? Give examples of few commonly encountered partial differential equations in physics and discuss the significance of any five of them.
- (ii) Discuss the method of separation of variables for solving a partial differential equation in the spherical polar coordinate system.

(B) Attempt any one of the following. **3**

- (i) What do you mean by boundary conditions with reference to ODEs and PDE? Discuss the various forms of these boundary conditions.
- (ii) Prove that $y = A\sin(\omega t - kx)$ is a solution of $\frac{d^2y}{dx^2} = \left(\frac{k^2}{\omega^2}\right)\frac{d^2y}{dt^2}$.

Q.3 (A) Attempt any two of the following. **7**

- (i) If $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 0 \\ 2 & -1 \end{bmatrix}$ then obtain the product A.B.

Calculate B.A if possible.

- (ii) 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.B is a null matrix.

- (iii) If $\sigma = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ and $\gamma = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ then show that multiplication of these diagonal matrices is commutative.

(B) Attempt any one of the following. **3**

- (i) If two matrices A and B are given by $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix}$ then prove that the direct product of A and B is not commutative.
- (ii) If three matrices A, B and C are given by $A = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$, $B = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$ and $C = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ then calculate $A \otimes B \otimes C$.

Q.4 (A) Attempt any one of the following. **7**

- (i) Explain the syntax rules for arrays and also discuss the use of multiple subscripts in arrays by taking an suitable example.

- (ii) What are logical operators in a C program? Discuss the precedence rules for logical operators giving examples.

(B) Attempt any one of the following. **3**

- (i) If a store keeper has a stock of bulbs having different wattage, then write a program in C illustrating the use of arrays to calculate the total cost of bulbs in the stock.
- (ii) Write a program in C to read and print a 5 x 2 matrix...

Q.5 (A) Attempt any one of the following. **7**

- (i) What are functions in C program? State the merits of functions in a C program. Write a program in C to define a function and explain it.
- (ii) State the rules for calling a function by taking an illustration and explain it.

(B) Attempt any one of the following. **3**

- (i) Write a program in C to define a function to calculate the area of a square.
- (ii) What is a palindrome? Write a program in C to check whether a given number is a palindrome.
