

RAN-2103000206021006
B. Sc. (Sem. VI) Examination March - 2026
Physics (OLD)
PH-611-Mathematical Method of Physics & 'C' Programming
[Total Marks: 50
સૂચના : / Instructions

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book
- (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.

Seat No.:

Student's Signature

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

- i. State the difference between an ordinary differential equation and a partial differential equation.
- ii. What do you mean by degree of a differential equation?
- iii. State the usefulness of the concept of singularity in differential equations.
- iv. Define matrices giving an example.
- v. If $A = \begin{bmatrix} -1 & 2 & -3 \\ 0 & 3 & 1 \\ 2 & 1 & 4 \end{bmatrix}$ then write the transpose of matrix A. Also define a null matrix giving an example.
- vi. What is an array variable.
- vii. With respect to C-functions, what is meant by arguments and parameters?
- viii. What is a switch statement? State its use.
- ix. What is the operation performed by the three logical operators !, && and || in C program?
- x. What are functions in C language program? Write the syntax of a function in C.

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

- 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. What is the method of separation of variables? Discuss the method of separation of variables for solving a partial differential equation in the cartesian coordinate system.

(B) Attempt any one of the following.
03

- i. What do you mean by boundary conditions with reference to ODEs and PDE?
Discuss the various forms of these boundary conditions.
- ii. Show that $y = A \cos x + B \sin x$ is a solution of the differential equation $\frac{d^2 y}{dx^2} + y = 0$

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

- i. If $\alpha = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $\beta = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ then show that multiplication of these diagonal matrices is communicative.

- 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 calculate the product of A and B.

Is $A \cdot B$ is a null matrix?

- iii. 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 show that $(\sigma_1 \sigma_2) \sigma_3 = \sigma_1 (\sigma_2 \sigma_3)$

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

- i. If two matrices A and B are given by $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$ then calculate their direct product $A \otimes B$.
- ii. If three matrices A, B and C are given by $A = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$, $B = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$, and $C = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$ then calculate $A \otimes B \otimes C$.

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

- i. Explain an array variable by giving an illustration. Also write a program in C to illustrate the use of an array.
- 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.**03**

- 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. There are 50 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.

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

- i. Discuss the syntax rules for a C-function declaration. State the essential rules for defining functions.
- ii. Write a program in C to define a function to reverse a given integer and explain it in details.

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

- i. Write a program in C to check if an integer is a palindrome.
- ii. If a bank gives simple interest at 7.5% per year if the balance in the individuals bank account is Rs. 10,000/- or more then write a program in C to define a function to calculate the interest earned.