



RAN - 2103000206021006

RAN-2103000206021006**B.Sc. (Sem. VI) Examination October - 2023****Mathematical Method of Physics and C-Programming****Physics - XI (Paper - PH - 611)****[Total Marks: 50****सूचना : / Instructions**

(१)

नीचे दशविवेक निशानीवाणी विगतो उत्तरवली पर अवश्य लपववी.
Fill up strictly the details of signs on your answer book

Name of the Examination:

B.Sc. (Sem. VI)

Name of the Subject :

Mathematical Method 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)

- What do you mean by a soliton?
- Mention any two general techniques used for solving second order partial differential equations.
- State the usefulness of the concept of singularity in differential equations.
- If $A = \begin{bmatrix} -1 & 2 & -3 \\ 0 & 3 & 1 \\ 2 & 1 & 4 \end{bmatrix}$ then write the transpose of matrix A.
- What is a null matrix? Give an example.
- What is an array variable?
- What is a switch statement? State its use.
- What is the use of a break statement in C program?
- What is the use of a continue statement in a C program?
- State the main disadvantages of global variables in C - language.

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

- i. What do you mean by boundary conditions with reference to ordinary and partial differential equations? Discuss the different boundary conditions required to be satisfied by a differential equation.
- ii. Discuss the method of separation of variables for solving a partial differential equation in the circular cylindrical coordinate system.

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

- (i) Show that the partial differential equation $\frac{\partial^2 \phi}{\partial x^2} + (1-x)\frac{\partial^2 \phi}{\partial y^2} = 0$ is parabolic for $x < 1$, is elliptic for $x < 1$ and is hyperbolic for $x > 1$.
- (ii) Check whether $x = 0$ an ordinary point or a regular singular point for the differential equation given by $2x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + (1-x^2)y = 0$.

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

- (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. If possible calculate B.A. also.

- (ii) If $P = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ and $Q = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ then show that multiplication of these diagonal matrices is communicative.

- (iii) If $\sigma_1 = \begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}$ and $\sigma_2 = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix}$ and $\sigma_3 = \begin{bmatrix} -3 & 1 \\ 2 & 0 \end{bmatrix}$ then prove that $(\sigma_1 \sigma_2) \sigma_3 = \sigma_1 (\sigma_2 \sigma_3)$ and $\sigma_1 (\sigma_2 + \sigma_3) = \sigma_1 \sigma_2 + \sigma_1 \sigma_3$.

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

- (i) If two matrices A and B are given by $A = \begin{bmatrix} -1 & 0 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 1 \\ 1 & 2 \end{bmatrix}$ then calculate their direct product $A \otimes B$ and $B \otimes A$.
- (ii) If three matrices A, B and C are given by $A = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ and $C = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$ then calculate $A \otimes B$ and $B \otimes C$.

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

- (i) Explain the concept of an array variable and discuss the use of multiple subscripts in arrays by taking a suitable example.
- (ii) What are logical operators in a C program? Write a program in C for a student to qualify for a degree with Physics as the main subject and Mathematics as the subsidiary subject for the following situations -
 - (a) Student should get 50% or more in Physics and 40% or more in Mathematics.
 - (b) If the student gets less than 50% in Physics he should get 50% or more in Mathematics. However, he should get at least 40% in Physics.
 - (c) If the student gets less than 40% in Mathematics and 60% or more in Physics, then the student is allowed to reappear in an examination in Mathematics to qualify.
 - (d) In all other cases, the student is declared to have failed.

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

- (i) 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 with necessary explanation that will print out the highest and the second highest marks obtained in the examination.
- (ii) Write a program in C to read and print a 4×3 matrix.

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

- (i) What are functions in C - language? Discuss the primary merits of functions in program development.
- (ii) Discuss the syntax rules for a C-function declaration. State the essential rules for defining functions.

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

- (i) Write a program in C to define a function to reverse a given integer.
- (ii) Write a program in C to check if an integer is a palindrome.