



RAN - 2103000205021006

**RAN-2103000205021006****T. Y. B. Sc. (Sem. - V) Examination March - 2023****Physics : Paper - XI (PH - 511)****Mathematical Method of Physics and C-Programming (New Course)****[ Total Marks: 50****सूचना : / Instructions**

(1)

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

Name of the Examination:

☛ T. Y. B. Sc. (Sem. - V)

Name of the Subject :

☛ Physics : Paper - XI (PH - 511) Mathematical Method of Physics and C-Programming (New Course)

Subject Code No.: 2103000205021006

Seat No.:

Student's Signature

- (2) Draw neat diagrams wherever necessary.
- (3) Symbols used in the paper have their usual meaning.
- (4) Figures to the right indicate full marks of the question.
- (5) Scientific calculator may be used.

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

1. What is the importance (significance) of the curvilinear coordinates?
2. What is gradient of a scalar function? Is gradient of a scalar function a vector?
3. What do you mean by a divergence free vector field ?
4. What are polynomials?
5. State two characteristics of the iteration method.
6. What are header files in C program?
7. What is a flow chart?
8. What do you mean by normal flow of control in a computer program?
9. What do you mean by a compound statement?
10. What is a logical expressions in a C program?

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

- (i) Define a differential vector operator ( $\vec{\nabla}$ )? Write the expression for gradient, divergence, curl and laplacian in (i) Cartesian coordinate system, (ii) Curvilinear coordinate system, (iii) Circular cylindrical coordinate system and (iv) Spherical polar coordinate system.
- (ii) (a) Resolve the circular cylindrical unit vectors into their cartesian components.  
(b) Resolve the spherical polar unit vectors into their cartesian components.

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

- (i) With  $\hat{q}_1$  a unit vector in the direction of increasing  $q_1$ , show that:  
$$\vec{\nabla} \times \hat{q}_1 = \frac{1}{h_1} \left[ \hat{q}_2 \frac{1}{h_3} \frac{\partial h_1}{\partial q_3} - \hat{q}_3 \frac{1}{h_2} \frac{\partial h_1}{\partial q_2} \right].$$
- (ii) If the coordinates of a point P in the cartesian coordinate is (3, 4, 10) then convert it into cylindrical coordinates.

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

- (i) Explain the Newton-Raphson method to obtain a real root of an equation  $f(x) = 0$ . Also use the Newton-Raphson method to find the root of the equation  $x \sin x + \cos x = 0$ .
- (ii) Define a forward difference operator. Also derive Newton's forward difference interpolation formula.

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

- (i) Using the iteration method find the real root near 3.8 of the equation  $2x - \log_{10} x = 7$  correct to four decimal places.
- (ii) The table below gives the values of  $\tan x$  for  $0.10 \leq x \leq 0.30$ . Find the value of  $\tan(0.12)$ .

$x$	0.10	0.15	0.20	0.25	0.30
$y = \tan x$	0.1003	0.1511	0.2027	0.2553	0.3093

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

- (i) Discuss numeric constants and its different types in C program. Also discuss the rules for specifying constants.
- (ii) Explain in details the operator precedence in C expressions giving illustrations. Also discuss the use of parentheses.

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

- (i) Write a program in C to read the radius of a circle and hence calculate its circumference and area.
- (ii) Write the algorithm and draw the flow chart to pick out the smallest of three given numbers.

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

- (i) Explain in details, the output functions and input functions in C - programming.
- (ii) Discuss the conditional statements in C programming.

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

- (i) Write the algorithm and draw the flow chart for picking up the largest of three given numbers.
  - (ii) Write a program in C to read the length, breadth and height of a rectangular slab and hence calculate its volume.
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