2103000205021006
EXAMINATION FEBRUARY-MARCH 2024
BACHELOR OF SCIENCE (FIFTH SEMESTER)
PHYSICS-XI PH-511
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 (FIFTH SEMESTER)**
   b. Name of the Subject: **PHYSICS-XI PH-511-MATHEMATICAL METHODS OF PHYSICS AND C-PROGRAMMING LEVEL 2**
   c. Subject Code No: **2103000205021006**
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.
6. Scientific calculator may be used.

Seat No:

Student's Signature

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

1. With reference to a coordinate system, what are scale factors?
2. On what factors does the choice of a coordinate system depend?
3. How would you define divergence of a vector at a point?
4. What are polynomials? Give an illustration.
5. Define a shift operator.
6. Which of the following is an invalid octal constant? Why? -0213; +04012; 0387 and 04.54. *
7. What is the significance of void main ()?
8. Write the C expression corresponding to $\frac{ab+c}{3y}$.
9. What is a pre-processor directive in C program? Give an example.
10. What is the importance of writing the getch() statement in a C program?

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

(i) What is 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) Discuss in details the spherical polar coordinate system drawing necessary diagram. Also write the expression for gradient, divergence, curl and the laplacian in the spherical coordinate system.

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

(i) With $\hat{q}_1$ a unit vector in the direction of increasing q_1, show that:
$\vec{\nabla}\,\hat{q}_1 = \frac{1}{h_1 h_2 h_3}\frac{\partial(h_2 h_3)}{\partial q_1}$

(ii) With $\hat{q}_3$ a unit vector in the direction of increasing q_3, show that:
$\vec{\nabla} x \hat{q}_3 = \frac{1}{h_3}\left[\hat{q}_1 \frac{1}{h_3}\frac{\partial h_3}{\partial q_2} - \hat{q}_2 \frac{1}{h_1}\frac{\partial h_3}{\partial q_1}\right]$

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

(i) Explain the bisection method to obtain a real root of an equation f(x)=0. Using this method, find the root of f(x)=tanx+x=0 correct upto two decimals if the approximate root lies between 2.0 and 2.1

(ii) What do you mean by interpolation? Derive Newton's forward difference interpolation formula

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

(i) Find the real root of $x^3 = 1 - x^2$ in the interval [0,1] using the iteration method correct upto 3 decimal places.

(ii) The table below gives the values of tanx for $0.10 \leq x \leq 0.30$. Find the value of tan(0.26).

x	0.10	0.15	0.20	0.25	0.30
y= tanx	0.1003	0.1511	0.2027	0.2553	0.3093

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

(i) Discuss arithmetic operators used in C. Also explain integer expressions and floating point expressions giving examples.

(ii) What are variables and scalar variables in a C program? Discuss the rules for declaring an identifier used as a variable name. Give few examples of valid and invalid identifiers.

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

(i) Write a program in C to convert a given temperature in celcius into both degree Fahrenheit and kelvin.

(ii) Write a program in C to calculate the perimeter and area of a rectangle.

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

(i) Explain in details the output functions and input function in C-programming.

(ii) Explain how the “do while” loop is used in a C program.

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

(i) Write a program in C to pick out the smallest of any three given numbers

(ii) Write a program in C to read the radius of a sphere and hence calculate its volume.

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