April 2015

Seat Number

* 0 3 7 4 *

खजिना - 022

PHYSICS PAPER - II : PHY - 122
Theoretical Physics
(12126)

P. Pages : 3

Time : Two Hours **Max. Marks : 40**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks.
5. Figures to the right indicates full marks.
6. Draw neat diagrams whenever necessary.
7. Use of logarithmic tables or simple electronic calculator is allowed.
8. Symbols have their usual meanings.

1. Attempt **any eight** of the following, select correct option. **8**

i) What is the addition of the complex numbers $6-5i$ and $3-i$

a) $9-6i$ b) $9+6i$

c) $3+6i$ d) $9-9i$

ii) The differential equation $dF = M(x, y)dx + N(x, y)dy$ is exact differential equation, if it is satisfies the condition.....

a) $\frac{\partial^2 x}{\partial y^2} = M(x, y) + N(x, y)$ b) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

c) $\frac{\partial f}{\partial y} = \frac{\partial^2 f}{\partial x^2}$ d) none of the above

iii) $\overline{A} \cdot (\overline{B} \times \overline{C}) = ...$

a) $\overline{A} \cdot \overline{B} + \overline{A} \cdot \overline{C}$ b) $\overline{B} \cdot \overline{C} + \overline{A} \cdot \overline{C}$

c) $\overline{A} \times \overline{B} + \overline{C}$ d) none of the above

iv) Vector product of two parallel vectors is .....

a) zero b) 1

c) ∞ d) none of the above

v) If $\phi(x, y, z)$ be a differential scalar field, then gradient of ϕ is .....

a) $\nabla\phi$ b) $\nabla^2\phi$

c) $\nabla\times\phi$ d) none of the above

vi) If $\overline{\nabla}\times\overline{V}\neq 0$, then vector field $\overline{V}$ is .....

a) irrotational b) rotational

c) Non solenoidal d) none of the above

vii) The divergence of curl of $\overline{A}$ is .....

a) 1 b) 0

c) ∞ d) 100

viii) Area of parallelogram whose sides are $\overline{A}$ & $\overline{B}$ is given by .....

a) $\overline{A}\times\overline{B}$ b) $\overline{A}\cdot\overline{B}$

c) $\overline{A}\cdot(\overline{A}\times\overline{B})$ d) none of the above

ix) $\hat{i}\times\hat{i}$ = ...

a) 1 b) $\hat{j}$

c) $\hat{k}$ d) 0

x) If F = f(x, y), then the total differential dF = ...

a) $F_x dx + F_y dy$ b) $F_y dx + F_x dy$

c) $x^2dx + y^2dx$ d) none of the above

2. Attempt **any four** of the following. **8**

a) Give the statement of De-Moiver's theorem.

b) Define vector triple product of three vectors.

c) Define field ? State its two types.

d) State Euler's Formula.

e) If $F(x, y) = x^3y^2 - e^{xy}$, then find F_x.

f) State Geometrical interpretation of scalar triple product.

3. Attempt **any two** of the following. **8**

i) If $\overline{A} = 2\hat{i} + 2\hat{j} - \hat{k}$ and $\overline{B} = 6\hat{i} - 3\hat{j} + 2\hat{k}$, then calculate.

a) $\overline{A} \cdot \overline{B}$ b) $\overline{A} \times \overline{B}$

c) Area of parallelogram whose sides are $\overline{A}$ & $\overline{B}$

ii) Using idea of total differential, find the approximate value of $\sqrt{(4.98)^2 + (12.02)^2}$

iii) Prove that $\overline{\nabla} \cdot (\phi\overline{A}) = \phi\overline{\nabla} \cdot \overline{A} + \overline{A} \cdot \nabla\phi$

4. a) Attempt **any two** of the followings. **6**

i) Find constants 'a', 'b' & 'c', so that $\overline{A} = (2x + y + az)\hat{i} + (bx - y - 3z)\hat{j} + (2x + cy + z)\hat{k}$ is irrotational.

ii) Express $\left(\frac{9 - 7i}{2 - 3i}\right)$ in the form of $x + iy$.

iii) If $u = e^x \cdot \cos y$ then show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$

b) Determine constant 'a' so that vectors **2**
$\overline{A} = 3\hat{i} + 2\hat{j} - a\hat{k}$ and $\overline{B} = 2\hat{i} + \hat{j} - 2\hat{k}$ are parallel.

5. Attempt **any one** of the following. **8**

i) Define curl of vector field, explain its physical significance and hence state the condition for rotational and irrotational vector field.

ii) What is Argand diagram ? Explain addition, substraction, multiplication and division of two complex numbers by using Argand diagram.

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