Seat Number

April-2016

किनार - 022

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PHYSICS PAPER – II : PHY-122
Theoretical Physics
(112202)

P. Pages : 4

Time : Two Hours **Max. Marks : 60**

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 indicating full marks.
6. Draw neat and labeled diagram whenever necessary.
7. Use of log table or standard electronic calculator is allowed.

1. a) Attempt **any six** select the correct option and rewrite the following. **6**

i) If θ_1 is the argument of Z_1 & θ_2 is the argument of Z_2, the argument of Z_1Z_2=.....

a) $\frac{\theta_1}{\theta_2}$ b) $\theta_1\theta_2$

c) $\theta_1+\theta_2$ d) $\theta_1-\theta_2$

ii) The angle between Z & $\dot{Z}$ is

a) 0 b) $\pi/2$

c) π d) $\frac{3\pi}{2}$

iii) The order of differential equation $\frac{d^2y}{dx^2} + xy^2 = 1$ is.

a) 0 b) 1

c) 2 d) 3

iv) If F (x, y, z) = 0 then $\left(\frac{\partial x}{\partial y}\right)_z\left(\frac{\partial y}{\partial z}\right)_x\left(\frac{\partial z}{\partial x}\right)_y = ...$

a) ∞ b) 1
c) -1 d) None of these

v) If $\vec{A}$ & $\vec{B}$ represents adjacents sides of parallelogram, then area of parallelogram is given by.

a) $|\vec{A}\cdot\vec{B}|$ b) $|\vec{A}\times\vec{B}|$
c) $\frac{1}{2}|\vec{A}\times\vec{B}|$ d) $|\vec{A}|$

vi) The magnitude of $\vec{A}=3\hat{i}-\hat{j}+\hat{k}$ is.

a) 3 b) $\sqrt{12}$
c) $\sqrt{10}$ d) None of these

vii) The curl of vector $\vec{B}$ is represented by.

a) $\vec{\nabla}\cdot\vec{B}$ b) $\vec{\nabla}\times\vec{B}$
c) $\vec{B}\times\vec{\nabla}$ d) $\vec{\nabla}\times\vec{A}$

viii) The Laplacian operator ∇^2 =.....

a) $\frac{\partial^2}{\partial x^2}$ b) $i\frac{\partial^2}{\partial x^2}$
c) $i\times\frac{\partial^2}{\partial x^2}$ d) None of these

b) Attempt **any six** of the following answer in one sentence. 6

i) Define modulus and argument of complex number Z=x+iy.

ii) Subtract 3-5i from 6+7i.

iii) Define ordinary differential equation.

iv) If F (x, y, z) = 0, then state first theorem related with partial differential equation.

v) State geometrical interpretation of scalar triple product.

vi) State any two characteristics of scalar product.

vii) Define $\left(\vec{\nabla}\right)$ del operator.

viii) Define vector field.

ix) Represent (2+3i) on Argand diagram.

2. Attempt **any six** of the following. 12

i) Represent Z_1Z_2 on Argand diagram when $Z_1 = 2\,e^{i\frac{\pi}{4}}$ & $z_2 = 3\,e^{i\frac{\pi}{2}}$.

ii) Transform $Z = 2\sqrt{3}+2i$ into exponential form.

iii) Find multiplication of $(7+5i)$ and $(-2+i)$.

iv) State the chain rule of differentiation.

v) $F(x,y) = e^{\sin xy}$. Find $\frac{\partial F}{\partial x}$.

vi) If $\vec{A} = 3\hat{i} - \hat{j} + \hat{k}$ and $\vec{B} = 2\hat{i} + 4\hat{j} + 6\hat{k}$, find $\vec{A}\cdot\vec{B}$.

vii) Show that $\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{B} = 2\hat{i} + 4\hat{j} + 6\hat{k}$ are parallel to each other.

viii) What do you mean by differentiation of vector.

ix) Define rotational vector field.

3. Attempt **any four** of the following. 12

i) Evaluate $\left(\cos\frac{\pi}{5} + i\sin\frac{\pi}{5}\right)\left(\cos\frac{2\pi}{5} + i\sin\frac{2\pi}{5}\right)^2$.

ii) Find modulus and argument of $\frac{3+2i}{3-2i}$.

iii) If $F=\frac{x}{y}$, prove that $x\frac{\partial F}{\partial x}+y\frac{\partial F}{\partial y}=0$.

iv) Show that $\vec{A}\cdot\left(\vec{B}\times\vec{C}\right)=-\vec{B}\cdot\left(\vec{A}\times\vec{C}\right)$.

v) Show that $\vec{\nabla}\cdot\vec{\nabla}\phi=\nabla^2\phi$.

vi) Show that $\vec{\nabla}\cdot\vec{r}=0$.

4. Attempt **any three** of the following. 12

i) Find all roots of $(i)^{1/3}$.

ii) State and obtain Euler's formula.

iii) Using idea of total differentials, find approximate value of.
$\sqrt{(12\cdot013)^2+(4\cdot987)^2}$

iv) Show that vectors $\vec{A}=\hat{i}-\hat{j}+\hat{k}$, $\vec{B}=2\hat{i}-\hat{j}+4\hat{k}$ and $\vec{C}=\hat{i}-2\hat{j}-\hat{k}$ are co-planer.

v) Explain the terms with examples.
i) Scalar field ii) Vector field

5. Attempt **any two** of the following. 12

i) Define curl of a vector field. Explain its physical significance.

ii) State De-Moivre's theorem. Explain the exponential form of complex number for power and roots.

iii) If $F(x,y)=a\log(x^2+y^2)$ show that $F_{xx}+F_{yy}=0$.

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