Oct-2013

Seat No. | | | | | | |

केंद्रक - 055

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

P. Pages : 3

Time : Two Hours

Max. Marks : 40

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same 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 right indicate full marks.
6. Draw necessary diagrams wherever necessary.
7. Use of lograthamic table or electronic calculator is allowed.
8. Symbols have their usual meaning.

1. Attempt **any eight** of the following. **8**

a) Add the complex numbers $z_1 = 6 - 5i$, $z_2 = 3 - i$.

b) Evaluate $\vec{i} \cdot (\vec{j} - \vec{k})$

c) State the de-moivre's theorem - mathematical statement.

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

e) If $z = 2 + 2i$ determine $|z|$.

f) State necessary and sufficient condition of exact differentiation.

g) If $\phi = \phi(x, y, z)$ define $\vec{\nabla}\phi$ equation.

h) State any two examples of vector field

i) If $\vec{A} = 2\vec{i} + 2\vec{j} - \vec{k}$ and $\vec{B} = 6\vec{i} - 3\vec{j} + 2\vec{k}$ calculate $\vec{A} \cdot \vec{B}$.

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2. Attempt **any four.** 8

a) if $p+iq=\frac{1+2i}{1-3i}$ find the values of p & q.

b) Write the complex number $-3i^2+i$ in standard form.

c) If $F=x^2-y^2$ and $x=r\cos\theta$, $y=r\sin\theta$ then find $(F_x)_y$.

d) If $F=x^3y^3-xy^3$ then find F_x, F_y.

e) Under what conditions the vector field is solenoidal and irrotational.

f) State physical meaning of grad ϕ.

3. Attempt **any two.** 8

a) Using Euler's formula obtain trigonometric functions
$\sin\theta$, $\cos\theta$, $\operatorname{cosec}\theta$, $\sec\theta$

b) Obtain partial derivatives If F = xy where $x=r\cos\theta$, $y=r\sin\theta$.

c) Find work done in moving an object along a vector $\vec{r}=\vec{i}+2\vec{j}-\vec{k}$
and applied force $\vec{f}=2\vec{i}+3\vec{j}+4\vec{k}$.

4. a) Attempt **any two.** 6

i) If $F=\frac{x}{y}$, Prove that $x\frac{\partial F}{\partial X}+y\frac{\partial F}{\partial y}=0$.

ii) Determine volume of parallelopiped defined by following three vectors

$\vec{A}=\vec{i}+2\vec{j}-3\vec{k}$

$\vec{B}=\vec{i}+\vec{k}$

$C=\vec{i}-2\vec{k}$

iii) Show that $\nabla \cdot \nabla\phi = \nabla^2\phi$

b) Find the real number x and y for which $(x + 2i)(1 - i) = 5 + iy$. 2

5. a) Attempt **any one.** 6

i) Explain vector triple product.

ii) Define grad ϕ, div $\vec{V}$ and carl $\vec{V}$, State physical significance of each in brief.

b) Express $z = \sqrt{2}i$ in polar form. 2

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