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**R—117—2017**

**FACULTY OF SCIENCE**

**B.Sc. (First Year) (First Semester) EXAMINATION**

**MARCH/APRIL, 2017**

**PHYSICS**

**Paper II (PHY-112)**

**(Mathematical Methods in Physics)**

**(MCQ & Theory)**

**(Monday, 10-4-2017)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

- N.B. :—*
- (i) All questions are compulsory.
  - (ii) All questions carry equal marks.
  - (iii) Use of non-programmable calculator and log table is allowed.
  - (iv) Figures to the right indicate full marks.
  - (v) Symbols have their usual meanings.

**MCQ**

1. Choose the *correct* alternative : 10

(i) If  $\vec{i}$ ,  $\vec{j}$  and  $\vec{k}$  are three vectors along  $x$ ,  $y$  and  $z$  axis then the rotation

of  $\vec{i} \times \vec{j} = \vec{k}$  while  $\vec{j} \times \vec{i} = \dots\dots\dots$

(a)  $\vec{k}$  (b)  $-\vec{k}$

(c)  $\vec{i} + \vec{j}$  (d)  $-\vec{i}$

(ii) In a vector field if  $\nabla \cdot \vec{V} = 0$  is called :

(a) Solenoidal vector (b) Rotational vector

(c) Irrotational vector (d) Laminar vector

P.T.O.

- (iii)  $\iiint_V \nabla \cdot \bar{V} \, dv = \iint_V \bar{V} \cdot ds$  is the mathematical statement of :
- Stockes' theorem
  - Green's theorem
  - Gauss divergence theorem
  - Dirichlet's theorem
- (iv) If  $z = x + iy$ , then  $|z|$  is :
- $\sqrt{(x + iy)^2}$
  - $\sqrt{x^2 + y^2}$
  - $\sqrt{x + iy}$
  - $\sqrt{x + y}$
- (v) The moduli of product of two complex number is product of their :
- Real number
  - Imaginary number
  - Moduli
  - Argument
- (vi) The connection between Cartesian co-ordinate and polar co-ordinate is established by basic :
- Trigonometry
  - Algebra
  - Calculus
  - Statics
- (vii) Let  $F(x, y)$  be a function of two independent variable  $x$  and  $y$  if  $y$  is regarded a constant :

$$\lim_{n \rightarrow 0} \frac{F(x + n, y) - F(x, y)}{n}$$

is called :

- Partial derivative of  $F(x, y)$
- Exact derivative of  $F(x, y)$
- Total differentiation of  $F(x, y)$
- Multiple derivative of  $F(x, y)$

- (viii) In polar co-ordinate,  $x$  co-ordinate is represented by :
- (a)  $r \sin \theta$  (b)  $r \cos \theta$   
 (c)  $r \tan \theta$  (d)  $r \cot \theta$
- (ix) Function having ..... magnitude discontinuities can be represented by Fourier series.
- (a) Negative (b) Zero  
 (c) Finite (d) Infinite
- (x) The group of even function is always ..... with respect to Y-axis.
- (a) Symmetric (b) Asymmetric  
 (c) Parallel (d) Coincide

### Theory

2. Attempt any *five* of the following : 10

- (a) Define scalar field.  
 (b) State volume integral.  
 (c) State Stokes' theorem.  
 (d) Define polar form of complex number.  
 (e) Find  $z_1 - z_2$  if  $z_1 = 2 + 3i$  and  $z_2 = 9 + 2i$ .  
 (f) Define chain rule.  
 (g) Give any *two* properties of Fourier series.

3. Attempt the following question : 10

- (a) Explain physical significance of the gradient of a scalar field.

Or

- (b) Explain the total differentiation for two variable  $x$  and  $y$ .

P.T.O.

- (c) Explain the graphical representation of complex number by argand diagram.

*Or*

- (d) Evaluate the coefficient  $bn$  of Fourier series.

4. Attempt the following question :

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- (a) Prove :

$$A \times (B \times C) = C(A \cdot B) - B(A \cdot C).$$

*Or*

- (b) (i) Explain the properties of argument.

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- (ii) State and explain Dirichlet's theorem.

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