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W—128—2018

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2018

(CBCS/CGPA Pattern)

PHYSICS

Paper II (Phy–112)

(Mathematical Methods in Physics)

(MCQ & Theory)

(Thursday, 25-10-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Non-programmable calculator and log table is allowed.

(*iii*) Symbols have their usual meanings.

MCQ

1. Choose the correct alternatives of the following : 10

(*i*) Two complex numbers $z_1 = x_1 + iy_1$ and $z_2 = x_2 + iy_2$ are said to be equal if :

(*a*) $x_1 = x_2$

(*b*) $x_1 = y_1$ and $x_2 = y_2$

(*c*) $x_1 = x_2$ and $y_1 = y_2$

(*d*) $x = ix_2$ and $y_1 = iy_2$

(*ii*) The scalar triple product of three vectors $\overline{A}$, $\overline{B}$ and $\overline{C}$ is given by :

(*a*) $\overline{A} \cdot (\overline{B} \cdot \overline{C})$

(*b*) $\overline{A} \cdot (\overline{B} \times \overline{C})$

(*c*) $\overline{A} \times \overline{B} \cdot \overline{C}$

(*d*) $\overline{A} \times (\overline{B} \times \overline{C})$

(*iii*) A number of the form $x + iy$ is called as :

(*a*) real number

(*b*) imaginary number

(*c*) rational number

(*d*) complex number

P.T.O.

(*iv*) In the Cartesian co-ordinate system, the vector differential operator ∇ is defined as :

(*a*) $\frac{\partial}{\partial x}+\frac{\partial}{\partial y}+\frac{\partial}{\partial z}$

(*b*) $\frac{\partial}{\partial x}\bar{i}+\frac{\partial}{\partial y}\bar{j}+\frac{\partial}{\partial z}\bar{k}$

(*c*) $\frac{\partial\phi}{\partial x}+\frac{\partial\phi}{\partial y}+\frac{\partial\phi}{\partial z}$

(*d*) $\frac{\partial\phi}{\partial x}\bar{i}+\frac{\partial\phi}{\partial y}\bar{j}+\frac{\partial\phi}{\partial z}\bar{k}$

(*v*) The modulus of a complex number $3 + 4i$ is equal to :

(*a*) 7 (*b*) 16

(*c*) 25 (*d*) 9

(*vi*) The divergence of a vector $\overline{A}$ is :

(*a*) $\nabla \cdot \overline{A}$ (*b*) $\nabla \times \overline{A}$

(*c*) $\nabla^2 \overline{A}$ (*d*) $\nabla \overline{A}$

(*vii*) Implicit functions are expressed in the form :

(*a*) $f(x, y) = 0$ (*b*) $f(x, y) = \frac{dy}{dx}$

(*c*) $f(x) = \infty$ (*d*) $f(x, y) = \frac{\partial^2 x}{\partial y^2}$

(*viii*) A Fourier series may be defined as a representation of a function in a series of :

(*a*) sines (*b*) cosines

(*c*) tan and cot (*d*) sines and cosines

(*ix*) If $f(x, y) = x^3y - xy^3$, then $\frac{\partial f}{\partial x}$ is equal to :

(*a*) 0 (*b*) $3x^2y - y^3$

(*c*) $3xy - y^2$ (*d*) $3x^2y^2 - xy^2$

(*x*) An even function $\int_{-\pi}^{\pi} f(x)\, dx$ is written as :

(*a*) $2\int_{0}^{\pi} f(x)\, dx$ (*b*) $\frac{1}{2\pi}\int_{0}^{\pi} f(x)\, dx$

(*c*) $\frac{1}{2\pi}\int_{0}^{\pi} f(-x)\, dy$ (*d*) 2π

Theory

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

(*a*) Define scalar and vector field.

(*b*) Add and subtract the following complex numbers :

$$2i + 5,\ 3 + 4i$$

(*c*) What is an implicit function ?

(*d*) State and define Fourier series.

(*e*) Explain the term partial differentiation.

(*f*) Define line and surface integral.

(*g*) State the advantages of Fourier series.

3. Attempt any *two* of the following : 10

(*a*) State and explain the chain rule.

(*b*) Using an Argand diagram explain the multiplication of two complex numbers.

(*c*) Evaluate the Fourier coefficient a_0.

(*d*) Prove the identity :

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

4. Attempt any one of the following :

(*a*) Define and explain the vector triple product of three vectors $\overline{A}$, $\overline{B}$ and $\overline{C}$.

(*b*) Write notes on :

(*i*) Partial differentiation

(*ii*) Division of two complex numbers using Argand diagram.