This question paper contains **4** printed pages]

R—116—2017

FACULTY OF SCIENCE

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

MARCH/APRIL, 2017

(CBCS Pattern)

PHYSICS

Paper II

(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 logarithmic table and non-programmable calculator is permitted.

MCQ

1. Attempt *all* : 10

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

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

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

(*ii*) The divergence of a vector field $\bar{A}$ is given by :

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

(*c*) $\nabla^2 \cdot \bar{A}$ (*d*) $\bar{\nabla}\phi$

P.T.O.

(*iii*) In the cartesian co-ordinate system, the vector differential operator $\bar{\nabla}$ is defined as :

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

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

(*iv*) Modulus of a complex number, $z = x + iy$ is = ...

(*a*) $\sqrt{x + y}$ (*b*) $-\sqrt{x^2 + y^2}$

(*c*) $+\sqrt{x^2 + y^2}$ (*d*) $\sqrt{x^2 - y^2}$

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

(*a*) Complex number (*b*) Real number

(*c*) Imaginary number (*d*) Rational number

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

(*a*) $x_1 = x_2$ and $y_2 \neq y_1$ (*b*) $x_1 = y_1$ and $x_2 = y_2$

(*c*) $x_1 = iy_1$ and $x_2 = iy_2$ (*d*) $x_1 = x_2$ and $y_1 = y_2$

(*vii*) The implicit functions are expressed in the form :

(*a*) $f(x) = dy/dx$ (*b*) $f(x, y) = 0$

(*c*) $f(x, y) = x + y$ (*d*) $f(x, y) = \infty$

(*viii*) If $x = y + e^y$, then $\frac{dy}{dx}$ = ...

(*a*) $\frac{1}{1 + e^y}$ (*b*) $\frac{1}{e^x - 1}$

(*c*) $\frac{1}{1 - e^x}$ (*d*) $\frac{1}{e^x + e^y}$

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

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

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

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

Theory

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

(*a*) Define scalar field and state its *two* examples.

(*b*) Explain the term partial differentiation.

(*c*) Define Fourier series.

(*d*) Define curl of a vector field.

(*e*) Add and subtract the following pair of numbers :

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

(*f*) State the polar form of a complex number.

(*g*) What is Maxima and Minima ?

3. Attempt the following : 10

(*a*) Evaluate the Fourier coefficient a_0.

Or

State and explain the chain rule of differentiation.

P.T.O.

(*b*) Explain the application of Fourier series analysis in square wave.

Or

Explain the representation of the complex number on an Aragand diagram.

4. Attempt any *one* of the following : 10

(*a*) Define and explain the scalar triple product of three vectors.

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

(*ii*) Discuss on change of variables from cartesian to polar co-ordinates.