

# VP & RPTP Science College-Vallabh Vidyanagar

## First Internal Test: 2013

T Y B.Sc. [Semester-V]

Subject-Physics US05CPHY02

Date: 01/10/2013 Tuesday

Time: 3.30 pm to 5.00 pm

Total Marks-30

### Q-1 Multiple Choice Questions: [One mark each] 6 X 1 =6

6

(i) If A is a matrix of order  $m \times n$ ; B is a matrix of order  $n \times m$  then  $C=AB$  is a matrix of order

- (a)  $m \times m$  (b)  $n \times m$   
(c)  $n \times n$  (d)  $m \times n$

(ii) The condition for orthogonality for curvilinear co-ordinates is

- (a)  $\frac{\partial u}{\partial r} \cdot \frac{\partial v}{\partial r} = 0$  (b)  $\frac{\partial r}{\partial u} \cdot \frac{\partial u}{\partial v} = 0$   
(c)  $\frac{\partial r}{\partial u} \cdot \frac{\partial r}{\partial v} = 0$  (d)  $\frac{\partial r}{\partial u} \cdot \frac{\partial r}{\partial v} = 0$

(iii) For Fourier series in real form the coefficients  $a_0$  are given as

- (a)  $\frac{2}{\pi} \int_{-\pi}^{\pi} f(x) dx$  (b)  $\frac{2}{\pi} \int_{-\pi}^{\pi} f(x) \sin nx dx$   
(c)  $\frac{1}{\pi} \int_{-\pi}^{\pi} f(x) dx$  (d)  $\frac{2}{\pi} \int_{-\pi}^{\pi} f(x) \cos nx dx$

(iv) The diffusion equation or Fourier equation of heat flow is

- (a)  $\frac{\partial u}{\partial t} = h \nabla^2 u$  (b)  $\frac{\partial u}{\partial t} = h^2 \nabla^2 u$   
(c)  $\frac{\partial^2 u}{\partial t^2} = h^2 \nabla^2 u$  (d)  $\frac{\partial u}{\partial t} = h^2 \nabla u$

(v)  $y = ax + b$  is the equation of

- (a) Straight Line (b) Straight line + curve  
(c) Parabola (d) Ellipse

(vi) The backward difference operator  $\nabla$  defined as

- (a)  $\nabla y_i = y_i - y_{i+1}$  (b)  $\nabla y_i = y_{i+1} - y_i$   
(c)  $\nabla y_i = y_{i-1} - y_i$  (d)  $\nabla y_i = y_i - y_{i-1}$

### Q-2 Answer the following questions in short [Attempt any three].

6

- (a) If  $u = 2x + 3$ ;  $v = y - 4$ ;  $w = z + 2$ , show that  $u, v, w$  are orthogonal.  
(b) Write  $3 \times 3$  unit matrix and null matrix.  
(c) Define Fourier series.  
(d) Write one dimensional diffusion equation, which is known as telegraphy equation.  
(e) Define and discuss interpolation.  
(f) Convert  $y = ae^{bx}$  in to equivalent equation of a straight line.

Q-3 Prove that the product of sets of two triads of mutually orthogonal vectors are reciprocal to each other.

6

OR

Q-3 Derive expression of curl in terms of orthogonal curvilinear system.

6

Q-4 Derive the expression of Fourier series for a periodic function  $f(x)$  in the interval  $(-\pi, \pi)$ .

6

OR

Q-4 Obtain Fourier series for a function  $f(x)$ , where

6

$$f(x) = 0 \text{ for } -\pi < x < 0 \text{ and } f(x) = \pi x/4 \text{ for } 0 < x < \pi$$

Q-5 Deduce Lagrange's interpolation polynomial of the degree  $n$ .

6

OR

Q-5 Using the method of least square find an equation that fits a straight line.

6

