

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

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(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) $\frac{\partial r}{\partial u} \cdot \frac{\partial r}{\partial u} = 0$

(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 ∇ 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].

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- (a) If $u = 2x + 3$; $v = y - 4$; $w = z + 2$, show that u, v, w are orthogonal.
 (b) Write 3×3 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.

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OR

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

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

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OR

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

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

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

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OR

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

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