

# VP & RPTP Science College

Vallabh Vidyanagar

BSc Examination [Semester: V] 2019

Subject: Physics Course: US05CPHY02

Date 03-10-2019, Thursday

Time: 11.00 am to 12.15 pm

Total Marks: 25

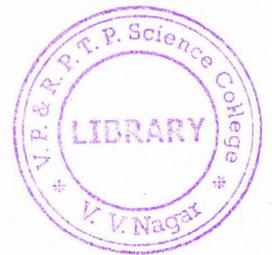
**INSTRUCTIONS:**

- 1 Attempt all questions.
- 2 The symbols have their usual meaning.
- 3 Figures to the right indicate full marks.

**Q-1 Answer the following MCQ's with correct option. (1 Mark each)**

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- (1) The matrix of order  $n \times m$  obtained from any matrix A of order  $m \times n$ , by interchanging its rows and columns is called \_\_\_\_\_.  
 (a) Traspose of a Matrix (b) Inverse of a Matrix  
 (c) Adjoint of a Matrix (d) Cofactor of a Matrix
- (2) The orthogonality condition for curvilinear co-ordinates is \_\_\_\_\_.  
 (a)  $\frac{\partial r}{\partial u} \cdot \frac{\partial u}{\partial v} = 0$  (b)  $\frac{\partial r}{\partial u} \cdot \frac{\partial r}{\partial u} = 0$   
 (c)  $\frac{\partial u}{\partial r} \cdot \frac{\partial v}{\partial r} = 0$  (d)  $\frac{\partial r}{\partial u} \cdot \frac{\partial r}{\partial v} = 0$
- (3) The generating function for Bessel's function of the order n is \_\_\_\_\_.  
 (a)  $e^{\frac{x}{2}(t-1)}$  (b)  $e^x$   
 (c)  $e^{\frac{x}{2}(t-\frac{1}{t})}$  (d)  $e^{x(t-\frac{1}{t})}$
- (4) The amount of heat  $\Delta H$  crossing an element of surface  $\Delta S$  in time  $\Delta t$  is given by  
 (a)  $\Delta H = K \Delta S \left| \frac{du}{dt} \right|$  (a)  $\Delta H = K \Delta S \Delta t \left| \frac{du}{dt} \right|$   
 (c)  $\Delta H = K \Delta t \left| \frac{du}{dt} \right|$  (c) None of these
- (5) Shift operator E = \_\_\_\_\_.  
 (a)  $\Delta - 1$  (b)  $\nabla + 1$   
 (c)  $\delta + 1$  (d)  $\Delta + 1$



**Q-2** Derive expression of gradient in terms of orthogonal curvilinear coordinates.

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**OR**

**Q-2** Derive expression of divergence in terms of orthogonal curvilinear coordinates.

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**Q-3** Derive the series solution of Legendre differential equation in the form of descending power of x only for  $k = n$  i.e. only  $P_n(x)$ . (not for  $k = -n - 1$ )

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**OR**

**Q-3** Derive the series solution of Bessel's differential equation in the form of ascending power of x only for  $k = +n$  i.e. only  $J_n(x)$ . (not for  $k = -n$ )

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**Q-4** Define Fourier series and Derive the expression of Fourier series in complex form for a periodic function  $f(t)$  in the interval  $(-\infty, \infty)$ .

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**OR**

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

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**Q-5** Define interpolation and extrapolation. Derive Newton's forward difference interpolation formula.

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**OR**

**Q-5** Using Lagrange's interpolation formula evaluate  $y = f(5)$  from the given data.

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$x$	1	3	4	6
$y = f(x)$	-3	0	30	132