Extra

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) **05**

(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 ΔH crossing an element of surface ΔS in time Δt 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. **05**

OR

Q-2 Derive expression of divergence in terms of orthogonal curvilinear coordinates. **05**

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 $k = -n - 1$) **05**

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 $k = -n$) **05**

Q-4 Define Fourier series and Derive the expression of Fourier series in complex form for a periodic function $f(t)$ in the interval $(-\infty, \infty)$. **05**

OR

Q-4 Define Fourier series and Derive the expression of Fourier series for a periodic function $f(x)$ in the interval $(-\pi, \pi)$. **05**

Q-5 Define interpolation and extrapolation. Derive Newton's forward difference interpolation formula. **05**

OR

Q-5 Using Lagrange's interpolation formula evaluate $y = f(5)$ from the given data. **05**

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