COURSE CODE (CREDITS): 25B11PH211(04) MAX. MARKS: 15
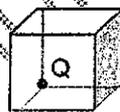COURSE NAME: Physics-II
COURSE INSTRUCTOR: PBB, SKK, SKT, SBA, HSR, HAZ MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.
(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems
(c) Use of calculator is allowed

Q. No	Question	CO	Marks
Q1	(a) Suppose electric field in some region is found to be $E = kr^3 \hat{r}$, in a spherical coordinate system, where k is constant. Calculate the charge density and total charge contained in a sphere of radius R. (b) A charge Q sits at the back corner of a cube, as shown in figure. What is $\oint E.dA$ through the shaded side?	2	3
Q2	Prove that $\nabla \times A = 0$ *if* $A = \frac{k}{r}\hat{\theta}$ in cylindrical coordinate system	1	2
Q3	An arbitrary point P in spherical and cylindrical co-ordinate system is denoted as (r,θ,ϕ), and (r,θ,z) . Find unit vector along r,θ,ϕ and r,θ,z in these systems.	3	2
Q4	Given $F(x,y,z) = (x^2+yz)i + (y^2-xz)j + (z^2+xy)k$, find the divergence $\nabla \cdot F$ at $(1,1,1)$. Classify it as a source or sink.	2	3
Q5	Find the total inner surface area of a well with radius 'r' and height 'h' by the integration method in a suitable coordinate system.	1	2
Q6	In a one-dimensional device, charge density is given by $\rho_v = \rho_0 \frac{x}{a}$. If E=0 at x=0 and V=0 at x=a, find V and E	4	3

$\varepsilon_0 = 8.85 \times 10^{-12}$ F/m; $\mu_0 = 4\pi \times 10^{-7}$ H/m