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SEMESTER II (B.TECH.) ACADEMIC YEAR: 2021-22

JAYPEE UNIVERSITY OF ENGINEERING & TECHNOLOGY GUNA

Test-II (Even Semester 2022)

18B11PH211 PHYSICS-II

MAXIMUM DURATION: 1 HOUR 30 MINUTES MAXIMUM MARKS: 25

IMPORTANT: Do not write any thing on the question paper except the Enrollment Number. All **five** questions are compulsory. The total marks for each question have been indicated next to it.

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1. (a) If the electric field in some region is given (in spherical polar coordinates) by the expression

$$\mathbf{E} = \frac{A\hat{\mathbf{r}} + B\sin\theta\cos\phi\hat{\phi}}{r},$$

where A and B are constants, calculate the corresponding charge density. [3]

(b) Calculate div $\mathbf{A}$, for $\mathbf{A} = \hat{x}x/r + \hat{y}y/r + \hat{z}z/r$, where $r^2 = x^2 + y^2 + z^2$. [2]

2. Calculate electric field a distance z above the midpoint of a straight line segment of length L, that carries a uniform line charge λ [5]

3. A hollow spherical shell carries a charge density $\rho = k/r^2$ in the region $a \leq r \leq b$. Calculate electric field in the three regions: (i) $r < a$ (ii) $a \leq r \leq b$, (iii) $r > b$. Plot $|\mathbf{E}|$ as function of r. [5]

4. Find the potential function and electric field intensity for the region between concentric right circular cylinders, where $V = 0$ Volt at $s = 1$ mm and $V = 150$ Volt at $s = 20$ mm. Neglect fringing. [5]

5. Find out the expression for the potential and electric field produced by a dipole at a distance r from the center of the dipole. [5]
