

2. A red LED emits light at 0.1 watt uniformly around it. The amplitude of the electric field of the light at a distance of 1 m from the diode is :

(1) 5.48 V/m

(2) 7.75 V/m

(3) 1.73 V/m

(4) 2.45 V/m ← Correct option

From (1) & (2),

Intensity of electromagnetic wave

$$I = \frac{1}{c\mu_0} \frac{E_m^2}{2} \quad \text{where } E_m \text{ is } \text{--- (1)}$$

max amplitude of Electric

field.

$$\text{Also } I = \frac{\text{Power (P)}}{\text{Area}} = \frac{P}{4\pi r^2} \text{ --- (2)}$$

$$r = 1 \text{ m}, P = 0.1 \text{ W},$$

$$E_m^2 = \frac{2c\mu_0 P}{4\pi r^2} = \frac{2 \times 3.0 \times 10^8 \times 4\pi \times 10^{-7} \times 0.1}{4\pi \times 1^2}$$

$$E_m^2 = 6.0 \text{ V}^2/\text{m}^2 \quad \therefore E_m = \sqrt{6} \text{ V/m} \\ \approx 2.45 \text{ V/m}$$