

1. Find the total charge inside the volumes indicated

$$\rho_v = 10 z^2 e^{-0.1x} \sin \Pi y, -1 \leq x \leq 2, 0 \leq y \leq 1, 3 \leq z \leq 3.6$$

- a. 100 C b. 119.478 c. 150 C d. 50 C

2. Four infinite uniform sheets of charge are located as follows : 20 pC/m^2 at $y = 7$, -8 pC/m^2 at $y = 3$, 6 pC/m^2 at $y = -1$, and -18 pC/m^2 at $y = -4$. Find \vec{E} at the point $P_A(2,6,-4)$

- a. $1 \vec{a}_y \text{ V/m}$ b. $2 \vec{a}_y \text{ V/m}$ c. $-2.259 \vec{a}_y \text{ V/m}$ d. $3 \vec{a}_y \text{ V/m}$

3. A point charge, $Q_1 = 10 \mu\text{C}$, is located at $P_1(1,2,3)$ in free space, while $Q_2 = -5 \mu\text{C}$ is at $P_2(1,2,10)$. Find the vector force exerted on Q_2 by Q_1

- a. $1 \vec{a}_z \text{ mN}$ b. $0.5 \vec{a}_z \text{ mN}$ c. $1.5 \vec{a}_z \text{ mN}$ d. $-1.834 \vec{a}_z \text{ mN}$

4. A -5 nC point charge is located at $A(2,-1,-3)$ in free space. Find \vec{E} at the origin

- a. $1.716 \vec{a}_x + 0.858 \vec{a}_y + 2.574 \vec{a}_z \text{ V/m}$, b. 0 c. ∞ d. insufficient data

5. Eight point charges of 1 nC each are located at the corners of a cube in free space that is 1 m

on a side. Find $|\vec{E}|$ at the centre of the cube

- a. zero b. ∞ c. 0.5 d. 1

6. A sheet of charge, $\rho_s = 2 \text{ nC/m}^2$, is present at the plane $x = 3$ in free space, and a line charge, $\rho_L = 20 \text{ nC/m}$, is located at $x = 1, z = 0.4$. Find the magnitude of the electric field intensity at the origin

- a. 100 V/m b. 158.543 V/m c. 200 V/m d. 50 V/m

7. Find a numerical value for the divergence of \vec{D} at the point indicated if

$$\vec{D} = 20xy^2(z+1)\vec{a}_x + 20x^2y(z+1)\vec{a}_y + 10x^2y^2\vec{a}_z \text{ C/m}^2 \text{ at } P_A(0.3,0.4,0.5)$$

- a. 2.5 C/m^3 b. 5 C/m^3 c. 7.5 C/m^3 d. 10 C/m^3

Questions 8 and 9 are Common data Questions

The spherical surfaces $r = 1, 2$ and 3 carry surface charge densities of $20, -9$, and 2 nC/m^2 , respectively

8. How much electric flux leaves the surface $r = 5$?

- a. 10 nC b. 5 nC c. 20 nC d. 25.1327 nC

9. Find \vec{D} at $P(1,-1,2)$

- a. $-2.667 \vec{a}_r \text{ nC/m}^2$ b. $5 \vec{a}_r \text{ nC/m}^2$ c. $10 \vec{a}_r \text{ nC/m}^2$ d. $15 \vec{a}_r \text{ nC/m}^2$

10. Given the potential field $V = 100 \sqrt{r} \text{ V}$ in free space, find : \vec{E}, \vec{D}

- a. $(-50/\sqrt{r}) \vec{a}_r \text{ V/m}, 0 \text{ C/m}^2$ b. $(-50/\sqrt{r}) \vec{a}_r \text{ V/m}, (-50\epsilon_0/\sqrt{r}) \vec{a}_r \text{ C/m}^2$ c. 0, $(-50\epsilon_0/\sqrt{r}) \vec{a}_r \text{ C/m}^2$
d. 0, 0

Questions 11,12 are common data questions

The region $y < 0$ contains a dielectric material for which $\epsilon_{R1} = 2.5$, while the region $y > 0$, is

characterized by $\epsilon_{R2} = 4$, Let $\vec{E}_1 = -30\vec{a}_x + 50\vec{a}_y + 70\vec{a}_z$

11. Find E_{N1}

- a. 10 V/m b. 20 V/m c. 50 V/m d. 0

12. Find E_{t1}

- a. 0 b. 20 V/m c. 10 V/m d. 76.158 V/m

13. Find the relative permittivity of the dielectric material used in a parallel plate capacitor if:

(a) $C = 40 \text{ nF}$, $d = 0.1 \text{ mm}$, and $S = 0.15 \text{ m}^2$; (b) $d = 0.2 \text{ mm}$, $E = 500 \text{ kV/m}$, and $\rho_s = 10 \mu\text{C/m}^2$

- a. 3.012, 2.259 b. 1, 2 c. 2, 3 d. 1, 3

14. Find the relative permittivity of the dielectric material used in a parallel plate capacitor if: $D = 50 \mu\text{C/m}^2$ and the energy density is 20 J/m^3

- a. 2 b. 7.059 c. 5 d. 0

15. Find \vec{H} at $P(2,3,5)$ in Cartesian coordinates if there is an infinitely long current filament passing through the origin and point C. The current of 50 A is directed from the origin to C, where the location of C is : $C(0,0,1)$

- a. $1.224 \vec{a}_x + 5 \vec{a}_y \text{ A/m}$ b. $2 \vec{a}_x + 3 \vec{a}_y \text{ A/m}$ c. $1.224 \vec{a}_x + 1.836 \vec{a}_y \text{ A/m}$ d. 0

#56, 2nd floor, Adj. Hotel Nammura, 22nd main, JP Nagar, 2nd phase, Bangalore-560 078.

Ph. 97419 00225/080 32491693.

www.instituteofengineeringstudies.com

ies4techies@gmail.com

16. Find \vec{H} at P(2,3,5) in Cartesian coordinates if there is an infinitely long current filament passing through the origin and point C. The current of 50A is directed from the origin to C, where the location of C is : C(0,1,0)

a. $2\vec{a}_x - 1\vec{a}_z$ A/m b. $5\vec{a}_x - 4\vec{a}_z$ A/m c. $0.5\vec{a}_x - 0.1\vec{a}_z$ A/m d. $1.372\vec{a}_x - 0.549\vec{a}_z$ A/m

17. For sea water with $\sigma = 5$ mhos/m and $\epsilon_r = 80$, $\mu = \mu_0$ find the distance a radio signal can be transmitted at 25 Kcps and 25 Mcps if the range is taken to be the distance at which 90 % of the wave amplitude is attenuated

a. 10 cm b. 5 cm c. 20 cm d. 15 cm

Key:

1.b 2.c 3.d 4.a 5.a 6.b 7.c 8.d 9.a 10.b 11.c 12.d
 13.a 14.b 15.c 16.d 17.a