Assignment 9

The due date for submitting this assignment has passed.

Instructions:
The objective of these questions is to assess your understanding of this week’s content. You are not expected to memorize any of the questions, rather, you should derive the answers from fundamental principles based on what you have learnt so far.

1. The PDE for the electric field in a material with conductivity $\sigma$ and permittivity $\varepsilon$ is given by $(\varepsilon \mu) G(3.5)$. The time derivative of electric field is:

   $\varepsilon \mu \frac{\partial E}{\partial t} + \nabla \times (\sigma \nabla E) = \rho$.

   a. $\varepsilon \mu \frac{\partial E}{\partial t} + \nabla \times (\sigma \nabla E) = \rho$.
   b. $\frac{\partial E}{\partial t} = \nabla \times (\sigma \nabla E) - \rho$.
   c. $\varepsilon \mu \frac{\partial E}{\partial t} = \nabla \times (\sigma \nabla E) - \rho$.
   d. None of the above.

   *Note: the given answer is (c) $\varepsilon \mu \frac{\partial E}{\partial t} = \nabla \times (\sigma \nabla E) - \rho$.

   Accepted Answers:
   c. $\varepsilon \mu \frac{\partial E}{\partial t} = \nabla \times (\sigma \nabla E) - \rho$.

2. A point charge $q$ is placed in a region where the electric field is given by $E(x, y, z) = q \delta(x) \delta(y) \delta(z)$. What is the electric field at the origin?

   a. $E(0, 0, 0) = q$.
   b. $E(0, 0, 0) = 0$.
   c. $E(0, 0, 0) = \infty$.
   d. None of the above.

   *Note: the given answer is (b) $E(0, 0, 0) = 0$.

   Accepted Answers:
   b. $E(0, 0, 0) = 0$.

3. A point charge $q$ is placed in a region where the electric field is given by $E(x, y, z) = q \delta(x) \delta(y) \delta(z)$. What is the electric field at the origin?

   a. $E(0, 0, 0) = q$.
   b. $E(0, 0, 0) = 0$.
   c. $E(0, 0, 0) = \infty$.
   d. None of the above.

   *Note: the given answer is (b) $E(0, 0, 0) = 0$.

   Accepted Answers:
   b. $E(0, 0, 0) = 0$.

4. A point charge $q$ is placed in a region where the electric field is given by $E(x, y, z) = q \delta(x) \delta(y) \delta(z)$. What is the electric field at the origin?

   a. $E(0, 0, 0) = q$.
   b. $E(0, 0, 0) = 0$.
   c. $E(0, 0, 0) = \infty$.
   d. None of the above.

   *Note: the given answer is (b) $E(0, 0, 0) = 0$.

   Accepted Answers:
   b. $E(0, 0, 0) = 0$.

5. A point charge $q$ is placed in a region where the electric field is given by $E(x, y, z) = q \delta(x) \delta(y) \delta(z)$. What is the electric field at the origin?

   a. $E(0, 0, 0) = q$.
   b. $E(0, 0, 0) = 0$.
   c. $E(0, 0, 0) = \infty$.
   d. None of the above.

   *Note: the given answer is (b) $E(0, 0, 0) = 0$.

   Accepted Answers:
   b. $E(0, 0, 0) = 0$.

6. A point charge $q$ is placed in a region where the electric field is given by $E(x, y, z) = q \delta(x) \delta(y) \delta(z)$. What is the electric field at the origin?

   a. $E(0, 0, 0) = q$.
   b. $E(0, 0, 0) = 0$.
   c. $E(0, 0, 0) = \infty$.
   d. None of the above.

   *Note: the given answer is (b) $E(0, 0, 0) = 0$.

   Accepted Answers:
   b. $E(0, 0, 0) = 0$.

7. A point charge $q$ is placed in a region where the electric field is given by $E(x, y, z) = q \delta(x) \delta(y) \delta(z)$. What is the electric field at the origin?

   a. $E(0, 0, 0) = q$.
   b. $E(0, 0, 0) = 0$.
   c. $E(0, 0, 0) = \infty$.
   d. None of the above.

   *Note: the given answer is (b) $E(0, 0, 0) = 0$.

   Accepted Answers:
   b. $E(0, 0, 0) = 0$.