**ITU PHYSICS ENGINEERING. STUDENT,** **oct07, 16**
**IDENTITY NUMBER :**
**NAME SURNAME :**
**FIZ 411E HOMEWORK – 1 (about CHAPTERS 1 and 2) due oct19, 16 Wendesday**
**Lecture book : introduction to electrodynamics 4th edition by David J. Griffiths** (**all figures from Lect. bk.**)
**POINT :**

[**Question.1**] About the fundamental theorems.

Solve by choosing the 'only one' of between the given three parts in the following:

[**Q.1a**] Write the fundamental theorem for gradients.
Then solve the Example 1.9 in the lecture book.

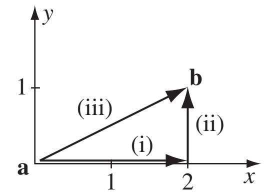


**FIGURE 1.27**

[**Q.1b**] Write the fundamental theorem for divergences (known as GAUSS' THEOREM or GREEN' S THEOREM).
Then solve the Example 1.10 in the lecture book.

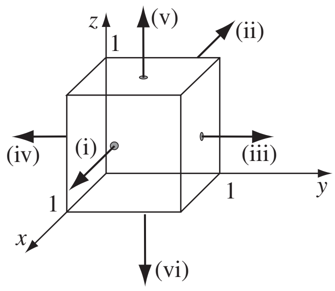


**FIGURE 1.29**

[**Q.1c**] Write the fundamental theorem for rotations (known as STOKES' THEOREM).
Then solve the Example 1.11 in the lecture book.

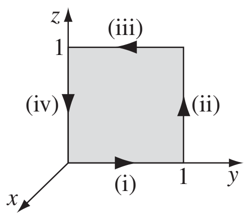


**FIGURE 1.33**

[**Question.2**] About the Dirac Delta Function.

[**Q.2.1**] List the Dirac Delta function properties.

[**Q.2.2**] With the help of Dirac Delta function (in three-dim.s),

[**Q.2.2.a**] Take the vector $\boldsymbol{v} = \frac{1}{r^2}\hat{\boldsymbol{r}}$. Find $\boldsymbol{\nabla} \cdot \boldsymbol{v} =$? in the spherical coordinates.

[**Q.2.2.b**] Take the separation vector $\boldsymbol{\mathscr{r}} \equiv \boldsymbol{r} - \boldsymbol{r'}$. Find $\boldsymbol{\nabla} \cdot (\frac{\hat{\boldsymbol{\mathscr{r}}}}{\mathscr{r}^2}) =$? in the spherical coordinates.

[**Q.2.2.c**] Find $\boldsymbol{\nabla}\, (\frac{1}{\mathscr{r}}) =$? and $\boldsymbol{\nabla}^2\, (\frac{1}{\mathscr{r}}) =$?

[**Question**.**3**] About the Electric field vector $\boldsymbol{E}$ definitions.

[**Q**.**3**.**1**] Think discrete charges (imagine as the following figure), write the most general expressions of Coulomb Force expression, $\boldsymbol{F}$ and then $\boldsymbol{E}$.

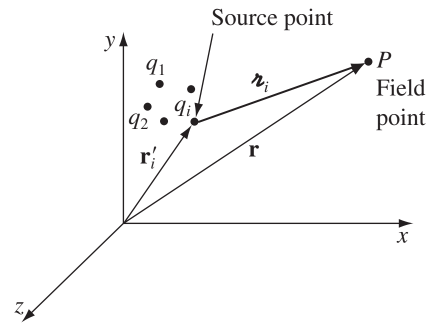


**FIGURE 2.3**

[**Q**.**3**.**2**] Think continuous charge distributions (imagine as the following figure(s)), firstly write the most general forms of charge distribution expressions and then $\boldsymbol{E}$ for each case.

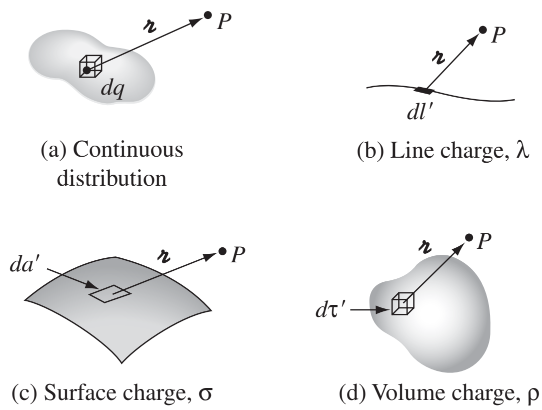


**FIGURE 2.5**

[**Question**.4] About the $\boldsymbol{E}$ of the continuous charge distribution system.

Solve the following problems:

Problem 2.5 (about continuous line charge distribution)

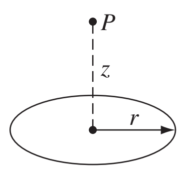


**FIGURE 2.9**

Problem 2.6 (about continuous surface(area) charge distribution)

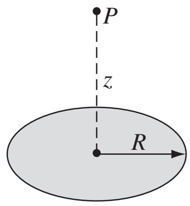


**FIGURE 2.10**

and Problem 2.8 (about continuous volume charge distribution)

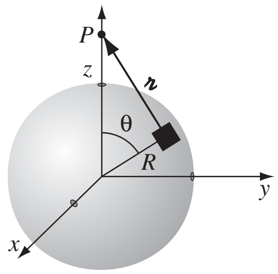


**FIGURE 2.11**

in the lecture book.

[**Question**.**5**] About the GAUSS' LAW (or divergence of electric field).

[**Q**.**5**.**1**] Give the most general expression for two forms (integral and differential form) of Gauss' Law in the cgs unit system. Why we need to use Gauss' Law? Write the needed conditions in order to use Gauss' Law.

[**Q**.**5**.**2**] Solve Problems 2.11, 2.12, and 2.13 in the lecture book.

[**Q**.**5**.**3**] Solve **Problem 2.16** in the lecture book.

[**Question**.**6**] About the Potential calculation.

[**Q**.**6**.**1**] Imagine continuous charge distributions, firstly write the most general forms of charge distribution expressions and then $V$ for each case.

[**Q**.**6**.**2**] Solve Example 2.8, Problems 2.24 and 2.25 in the lecture book.

[**Question**.**7**] About the Energy of a Continuous Charge Distribution.

Solve Example 2.29 and Problem 2.34 in the lecture book.

[**Question**.**8**] About Induced Charges.

Solve Example 2.39 in the lecture book.

[**Question**.**9**] About Surface Charge and the Force on a Conductor.

Solve Problems 2.41 and 2.42 in the lecture book.

[**Question**.**10**] About Capacitors.

Solve Examples 2.11 and 2.12 and Problem 2.43 in the lecture book.