

EE 207 Electromagnetics I  
First Midterm

March 12, 2011

Q1) A uniformly charged infinite line parallel to the z axis carrying a linear charge density  $\rho_L$  C/m passes through the point (1, 1, 0). If another line carrying density  $-2\rho_L$  C/m passes through the point (-1, -1, 0) find:

- (a) the expression for the total electric field vector at (x, y, 0).
- (b) the coordinates of the point lying on the line  $x=y$  at which the total electric field vanishes.

Q2) (a) Find the electric scalar potential at (0, 0, z) due to a uniformly charged circular sheet of radius b centered on the origin and having a surface charge density  $\rho_s$  C/m<sup>2</sup>.

- (b) Find the electric field intensity due to the above sheet from the potential.
- (c) Given a uniformly charged cylinder of radius b having a volume charge density  $\rho_v$  C/m<sup>3</sup> and whose axis coincides with the z axis, find a relationship between  $\rho_s$  of part (a) and  $\rho_v$ .
- (d) Find an expression for the electric field of the uniformly charged cylinder of part (c) at (0, 0, z) by using the result of part (b) and assuming that the cylinder extends from  $z = 0$  to  $z = L$ .

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