#### DRILL PROBLEMS: CHAPTER 2

#### D 2. I

(a) 
$$R_{AB} = (5+6) a_x + (8-4) a_y + (-2-7) a_z = 11a_x + 4a_y - 9a_z$$

(b) 
$$R_{AB} = \sqrt{11^2 + 4^2 + 9^2} = 1476 \text{ m}$$

(c) 
$$F_{BA} = \frac{(-20 \times 10^{-6})(50 \times 10^{-6})}{4\pi (\frac{10^{-9}}{16\pi})(14.76^2)} a_{BB} = -0.0413 \frac{(-11a_x - 4a_y + 9a_z)}{14.76} = 30.78a_x + 11.195a_y - 25.18a_z \text{ mN}$$

(d) 
$$F_{a,b} = \frac{(-20 \times 10^{-6})(50 \times 10^{-6})}{4\pi \times 88554 \times 10^{-12}(14.76^2)} \ \alpha_{b,a} = -0.04125 \ \frac{(-11\alpha_x - 4\alpha_y + 9\alpha_z)}{14.76} = 30.74\alpha_x + 11.18\alpha_y - 25.15\alpha_z \ mN_z = -0.04125 \ \frac{(-11\alpha_x - 4\alpha_y + 9\alpha_z)}{14.76} = -0.04125 \ \frac{(-11\alpha_x - 4\alpha_$$

#### D 2.2

(a) 
$$r - r_A = -25a_x + 30a_y - 15a_z$$
,  $|r - r_A| = 41.43$   
 $r - r_B = 10a_x - 8a_y - 12a_z$ ,  $|r - r_B| = 17.54$   
 $E_A = -1.57 \frac{(-25a_x + 30a_y - 15a_z)}{41.43} = 9480a_x - 11300a_y + 5600a_z$   
 $E_B = 14.61 \frac{(10a_x - 9a_y - 12a_z)}{17.54} = 83300a_x - 66600a_y - 99900a_z$   
 $E_T = E_A + E_B = 92.48a_x - 77.9a_y - 94.3a_z \frac{kV}{m}$ 

(b) 
$$r - r_A = -10a_x + 50a_y + 35a_z$$
,  $|r - r_A| = 61.84$   
 $r - r_B = 25a_x + 12a_y + 38a_z$ ,  $|r - r_B| = 47.04$   
 $E_A = -7050 \frac{(-10a_x + 50a_y + 35a_z)}{61.04} = 1140a_x - 5700a_y - 3990a_z$   
 $E_B = 20300 \frac{(25a_x + 12a_y + 38a_z)}{47.04} = 10700a_x + 5180a_y + 16400a_z$   
 $E_T = E_A + E_B = 11.84a_x - 0.52a_y + 12.41a_z \frac{kV}{m}$ 

#### D 2.3

(a) Sum = 
$$2 + 0 + \frac{2}{5} + 0 + \frac{2}{17} + 0 = 2.517$$

**(b)** Sum = 
$$\frac{1.1}{11.10} + \frac{1.01}{22.62} + \frac{1.001}{46.07} + \frac{1.0001}{89.44} = 0.1755$$

# **Electromagnetic Wave Theory Solution Manual**

Michael F. Modest, Sandip Mazumder

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