1. A point charge $q_1 = 2\ \mu C$ is placed at the origin. Find the electric fields at point A (3,0) cm from origin .

   (Ans : $+2.0 \times 10^7$ N/C $\boldsymbol{i}$)

2. Find the total electric field along the line of the two point charges shown in figure 2.10 below at the midpoint between them.

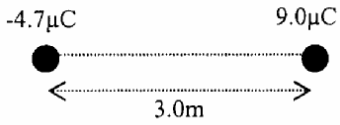

Figure 2.10

   (Ans : -54800 N/C $\boldsymbol{i}$)

3. Three point charges are arranged as in a figure 2.11. Determine the electric fields at point R due to other charges.

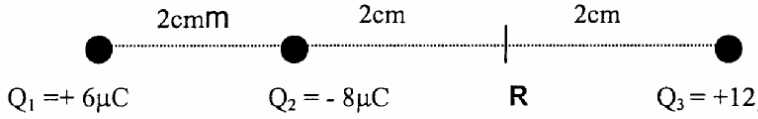

Figure 2.11

   (Ans : -4.16×10^8 NC^{-1} $\boldsymbol{i}$)

4. A point charge $Q_1 = 2\mu C$ is placed at the origin and charge $Q_2 = -3\mu C$ at (3,0) cm as Figure 2.12 ,
   (a) Sketch electric field vector E_1 and E_2 at point P due to charge Q_1 and Q_2.
   (b) write the vector component for field at point P due to Q_1 charge.
   (c) write the vector component for field at point P due to Q_2 charge.
   (d) write the vector component for resultant electric field at point P
   (e) find the magnitude and direction for resultant electric field at point P
   (f) if a point charge - 5μC is placed at point P, determine the force experience by this charge due to electric field at point P.

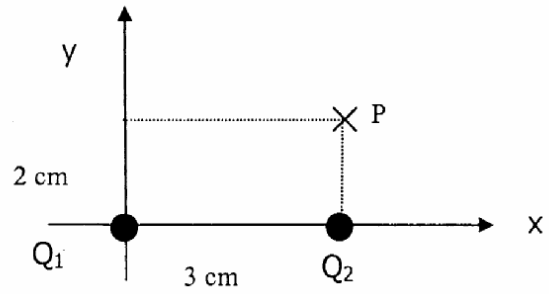

Figure 2.12

{Ans : b) 1.148×10^7 N/C$\boldsymbol{i}$ + 0.766×10^7 N/C $\boldsymbol{j}$ c) -6.75×10^7 N/C $\boldsymbol{j}$ d) 1.148×10^7 N/C$\boldsymbol{i}$ - 5.98×10^7 N/C $\boldsymbol{j}$ e) 6.1 X 10^7 N/C , 281^0 @ (79.1^0 4th quarter) f) 305N , 11^0 (2nd quarter) }

5. Two point charges $Q_1 = +5\mu C$ and $Q_2 = +15\mu C$ lie 5m apart on a straight line in a vacuum as shown in Figure 2.13. Find the point between of two charges where the resultant electric fields intensity is zero.

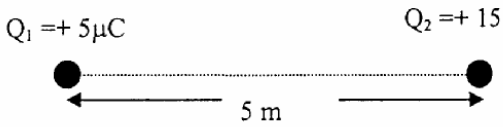

Figure 2.13

(Ans : 1.83m from Q_1)

6. Two point charges Q_1 and Q_2 lay 6m apart on a straight line as shown in Figure 2.14. Find the potential at the point midway between two charges.

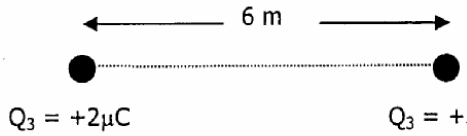

Figure 2.14

(Ans : 21kV)

7. Two point charges $Q_1 = +20\ \mu C$ and $Q_2 = -10\mu C$ are 20 cm as shown in Figure 2.15. Find
   (a) the potential at point x
   (b) the potential at point y
   (c) potential difference between points x and y.
   (d) work done to move a charge 5μC from x to y.

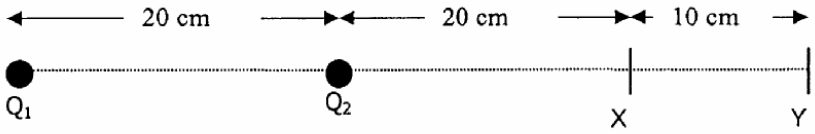

Figure 2.15

(Ans : 0V, 60kV, - 0.3J)

8. Two point charges Q_1 and Q_2 are arranged as shown in Figure 2.16. Find
   (a) the potential at point A and B
   (b) work necessary to move a +20 μC test charge from point A to B
   (c) work done to move a 5μC test charge from point B to infinity

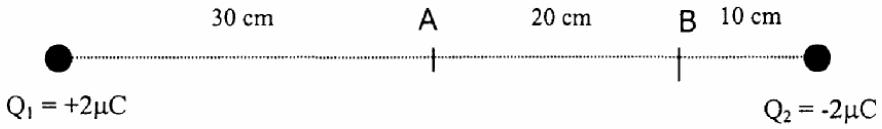

Figure 2.16

(Ans : 0V, -1.44X 10^5V, +2.88J, -0.72J)

9. Question 9 is referring to the Figure 2.17,
   (a) Calculate the electric force on Q_1 due to other charges.
   (b) Find the electric field at origin (0,0)
   (c) Calculate the electric potential at origin (0,0)

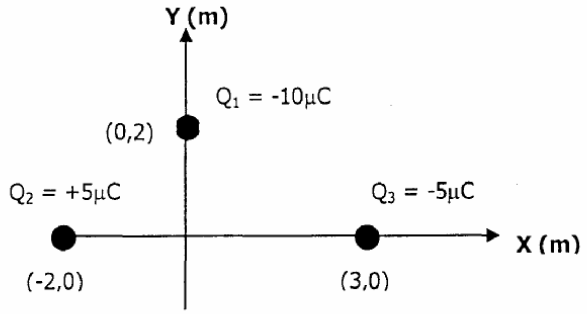

Figure 2.17

(Ans : (a)0.072N, 16.93(4^{th} quarter) ; (b) 27.75 x $10^3 NC^{-1}$, $\theta = 54.2^0$ 1^{st} quarter ; (c) -37.53 x 10^3V)

10. Question 10 is referring to the Figure 2.18
    (a) draw the electric force vector on Q_3 due to charge Q_2 and Q_1
    (b) find the resultant force on Q_3 .
    (c) find the electric potential at point A and P
    (d) find work done to move a charge 2.0μC from point P to A.

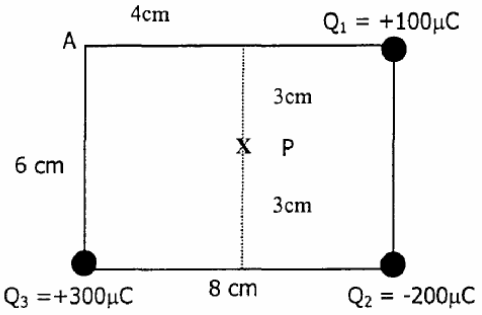

Figure 2.18

Ans : (b) 64831N , 14.5° (4^{th} quarter) ; (c) 3.825 x 10^7 V (c) 3.6 x 10^7 V ; (d)-4.5 J

11. A small 2g plastic ball is suspended by a 20cm long string in a uniform electric field (Figure 2.19). If the ball is in equilibrium when the string makes a 15^0 angle with the vertical as indicated, what is the net charge on the ball? ($g = 9.80 ms^{-2}$).
(Ans : 5.25 x 10^{-6} C)

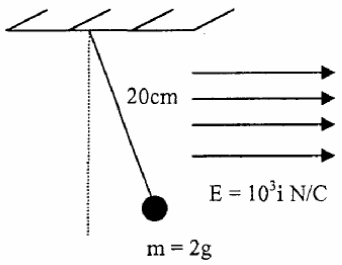

Figure 2.19