Q.2. As Node A can hear the becons located at (4,2) and (2,5) and Node B can hear beacons located at (2,5) and (3,7) we can find the distance b/w beacon points and the given position for the sensor. As the range is 2m the distance should be less than equall to 2m.

∴

- for position (3, 3.5) for Node A.

a) the distance from (4,2) is

$$d = \sqrt{(4-3)^2 + (2-3.5)^2}$$

$$= \sqrt{1 + (-1.5)^2}$$

$$= \sqrt{3.25}$$

$$= 1.803$$

b) the distance from (2,5) is

$$d = \sqrt{(2-3)^2 + (5-3.5)^2}$$

$$= \sqrt{(-1)^2 + (1.5)^2}$$

$$= \sqrt{1 + 2.25}$$

$$= 1.803$$

- for position (3, 4.5) for Node A

a) the distance from (4,2) is

$$d = \sqrt{(4-3)^2 + (2-4.5)^2}$$

$$= \sqrt{(1)^2 + (-2.5)^2}$$

$$= \sqrt{1 + 6.25}$$

$$= 2.693$$

b) the distance from (2,5)

$$d = \sqrt{(2-3)^2 + (5-4.5)^2}$$

$$d = \sqrt{(-1)^2 + (0.5)^2}$$

$$d = \sqrt{1 + .25}$$

$$d = 1.118$$

Now the position of Node A is (3, 3.5) as it can hear beacon at positions (4,2) and (2,5) and the distance from both this points to (3,3.5) is less than 2. ∴ the position is (3, 3.5) as the other point has a distance >2 from one of the beacon shown above.

- for position (2,6) for Node B.

a) the distance from (2,5) is

$$d = \sqrt{(2-2)^2 + (5-6)^2}$$

$$d = \sqrt{(-1)^2}$$

$$d = 1$$

b) the distance from (3,7) is

$$d = \sqrt{(3-2)^2 + (7-6)^2}$$

$$d = \sqrt{1^2 + 1^2}$$

$$d = \sqrt{2}$$

$$d = 1.414$$

- for position (4,5) for Node B to position (3,7)

a) $$d = \sqrt{(4-3)^2 + (5-7)^2}$$

$$= \sqrt{(1)^2 + (-2)^2}$$

$$= \sqrt{1+4}$$

$$= \sqrt{5}$$

$$d = 2.236$$

b) the distance from (2,5) is

$$d = \sqrt{(2-4)^2 + (5-5)^2}$$

$$d = \sqrt{(-2)^2}$$

$$d = 2$$

∴ As from the distance above it is cleare that position for Node B is (2,6) as the distance from both the beacons is less than 2 where this is not the case with position (4,5). Hence position of B is (2,6).

* In Addition this can also be verified be Node Centroid theory.

• the centroid for the two beacon for Node A is

$$= \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}$$

$$= \frac{4+2}{2}, \frac{5+2}{2}$$

$$= (3, 3.5)$$

∴ the position of Node A is (3, 3.5)

- the centroid for two beacons for Node B is

$= \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$

$= \frac{2+3}{2}, \frac{12}{2}$

$= (2.5, 6)$

∴ the position for B has to be close to (2.5, 6) which is (2, 6) in this case hence the answers or position are verified.