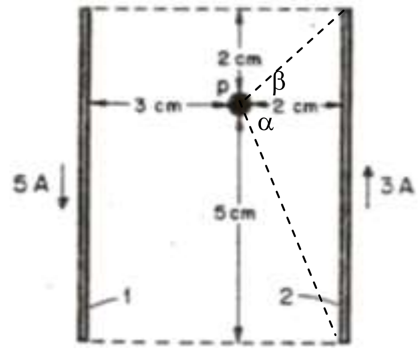
Q1- What is the flux density at point P in Figure due only to the 3-A current in the portion of wire 2 shown?

The magnetic field (flux density) due to section of straight wire at a point P where its ends makes angle α and β with the perpendicular on wire is given by



$$B = \frac{\mu_0 I}{4\pi d}(\sin\beta - \sin\alpha)$$

Here I is the current in the wire and d is the distance of the wire from point P

If we consider 3 A wire it is subtending angles β and - α hence the field at P is given by

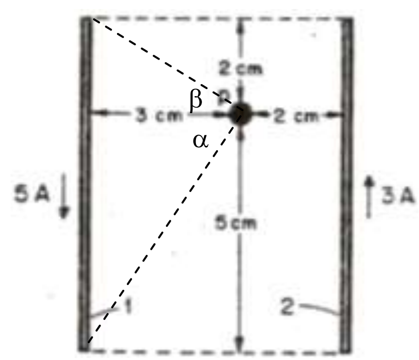
$$B = \frac{\mu_0 I}{4\pi d}(\sin\beta - \sin\alpha)$$

$$B_2 = \frac{10^{-7} * 3}{0.02}\left(\frac{1}{\sqrt{2}} + \frac{5}{\sqrt{5^2 + 2^2}}\right) = 2.45*10^{-5} \text{ T}$$ [sin (-α) = - sin α]

Using right hand rule this field is out of the paper

Q2- What is the total flux density at point P

The magnitude of the field due of wire carrying current of 5A is given by



$$B = \frac{\mu_0 I}{4\pi d}(\sin\beta - \sin\alpha)$$

Or $$B_1 = \frac{10^{-7} * 5}{0.03}\left(\frac{2}{\sqrt{2^2 + 3^2}} + \frac{5}{\sqrt{5^2 + 3^2}}\right)$$

Or $B_1 = 2.35*10^{-5}$ T

According to the right hand rule this field is also out of the paper and hence the total magnetic field or flux density at P will be

$$B_2 + B_1 = (2.45 + 2.35) *10^{-5} \text{ T} = 4.8*10^{-5} \text{ T}$$

This resultant field is also out of the paper as both fields are in that direction.
