5 **(a)** Define *magnetic flux density*.

.....

.....

.....

..... [1]

(b) Fig. 5.1 shows the top-view of three long, parallel, straight wires that are normal to the plane of paper. The cross-sections lie at the corners of a square of sides *L*. Wire 1 and wire 2 carry the same amount of current that is directed into the paper.

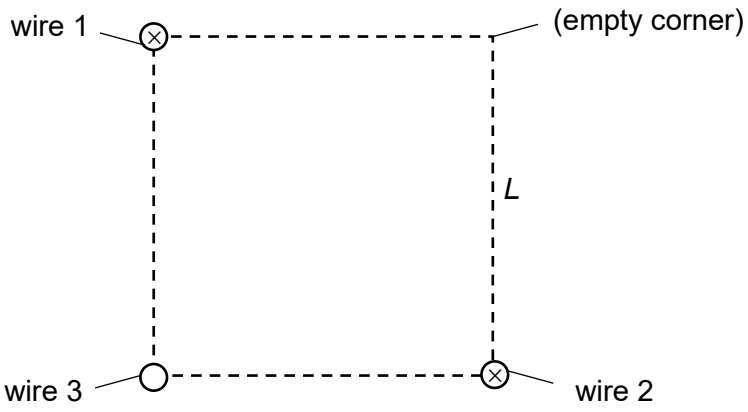

Fig. 5.1 (not to scale)

(i) On Fig. 5.2, draw the magnetic field lines due to the currents in wire 1 and 2.

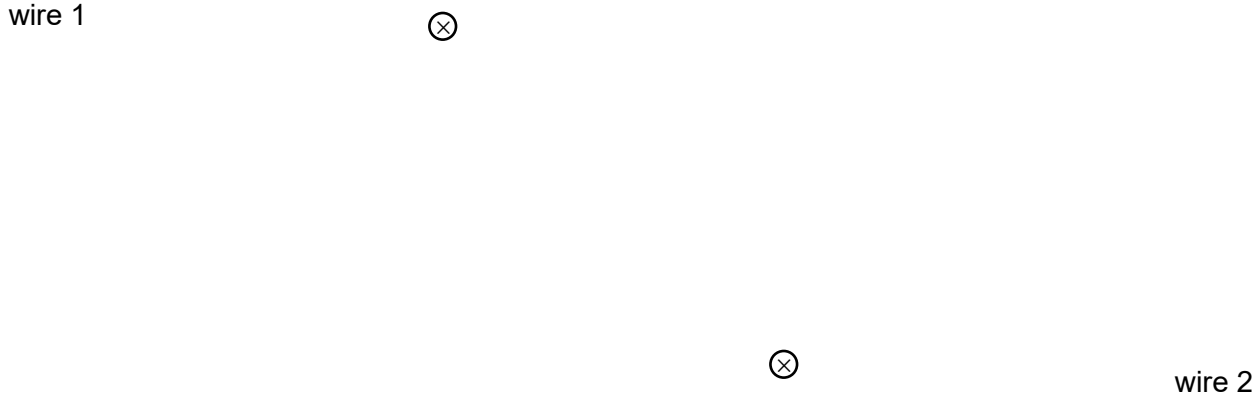

Fig. 5.2

[1]

(ii) On Fig. 5.1, the resultant magnetic field at the empty corner is zero. The current in wire 1 and wire 2 is $I_1 = I_2 = I_s$, while the current in wire 3 is I_3.

Determine the

1. direction of the current in wire 3, and

2. the ratio $\frac{I_s}{I_3}$.

direction = …….

ratio = ……. [5]

[Total: 7]