Question:

A rectangular coil of dimensions 20cm by 15cm lies with its plane parallel to a magnetic field of 05Wm2 . The coil, carrying a current of 10A experiences a torque of 4.5Nm in the field. How many loops has the coil?
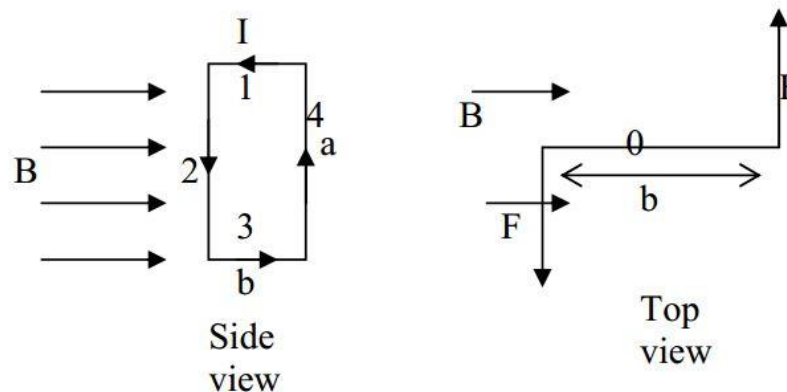
100

60

30

20

Answer:

Ampère's force law for one side:

$$F = IBa$$

where a is side's length of coil, B is magnetic field, I current.

Considering that we have 2 sides and N loops total force equals:

Side view

Top view

$$F_{tot} = 2IBaN$$

Therefore torque equals:

$$M = 2IBaN\frac{b}{2} = IBNab$$

And number of loops:

$$N = \frac{M}{IBab} = 30$$

Answer: 30