Q.11] A magnetic pole of bar magnet with pole strength of 100 Am is 20 cm away from the centre of a bar magnet. Bar magnet has pole strength of 200 Am and has a length 5cm. If the magnetic pole is on the axis of the bar magnet, find the force on the magnetic pole.

Soln → Given $(q_m)_1 = 200\ Am$

$(2l) = 5\ cm = 5 \times 10^{-2}\ m$.

$\therefore m = 200 \times 5 \times 10^{-2} = 10\ Am^2$.

for a bar magnet, magnetic dipole moment is,

$m = q(2l)$.

for a point on the axis of a bar magnet at distance $r = 20\ cm = 0.2\ m$

$$B_a = \frac{\mu_0}{4\pi} \times \frac{2m}{r^3}$$

$$= 10^{-7} \times \frac{2 \times 10}{(0.2)^3}$$

$$= 0.25 \times 10^{-3}$$

$$\boxed{B_a = 2.5 \times 10^{-4}\ wb/m^2}$$

$$F = q_m B_a = 100 \times 2.5 \times 10^{-4}$$

$$\boxed{F = 2.5 \times 10^{-2}\ N}$$

Q.12] Two small and similar bar magnets have magnetic dipole moment of $1.0\ Am^2$ each. They are kept in a plane in such a way that their axes are perpendicular to each other. A line drawn through the axis of one magnet passes through the centre of other magnet. If the distance between their centres is 2m., find the magnitude of magnetic field, at the ~~mid~~ magnitude of magnetic field at the midpoint of the line joining their centres.