NCERT EXERCISE

Ch- 4

1. no. of turns on coil = 100
radius of coil drawn - 8 cm = 0.8 m
magnitude in coil = 0.4A

Magnitude in Magnetic field lines at centre of coil can be obtained by

$|B| = \frac{\mu_0 2\pi n I}{4\pi r}$

Permeability $= \frac{4\pi \times 10^{-7}}{4\pi} \times \frac{2\pi \times 100 \times 10^{4}}{0.8}$

$= 3.14 \times 10^{-4}$

Magnitude $= 3.14 \times 10^{-4} T$

2. Magnitude of Current = 35 A.
r 20 cm or 0.2 m

$|B| = \frac{\mu_0 2I}{4\pi r}$

μ_0 - permeability of free space
$4\pi \times 10^{-7}$ m A/T

$B = \frac{4\pi \times 10^{-7}}{4\pi} \times \frac{2 \times 35}{0.2}$

$= 3.5 \times 10^{-5} T$

3. l of wire = 3 cm
magnitude of current flowing = 10A
strength of magnetic field = 0.275
angle between Current and magnetic field = $\theta = 90$

$F = BI\,l\,\sin\theta$

$0.27 \times 6 \times 0.3 \times 5 \sin 90$

$8.1 \times 10^{-2} N$

Magnetic force = 8.1×10^{-2} N
direction can be obtained from flemings left hand rule.

Magnitude of current flowing = 8A = (I_A)
Magnitude of current is B = 5 A (I_B)
distance between them = 0.04 m/4cm
length of section of wire A (l)
= 10 cm = 0.1 m

$$F = \frac{\mu_0 I_A I_B l}{2\pi r}$$

permeability = $4\pi \times 10^{-7}$ T m A^{-1}

$$F = \frac{4\pi \times 10^{-7} \times 8 \times 5 \times 0.1}{2\pi \times 0.04} = 2 \times 10^{-5} N$$

Magnitude = 2×10^{-5} N.

Solenoid = l = 80 cm
= 0.8 m.

no. of turns on solenoid = 5 × 400
= 2000 N.

Solenoid diameter = 1.8 m = 0.018 m
Current carried = 8.0A.

$$B = \frac{\mu_0 N I}{l}$$

μ_0 = permeability of free space
= $4\pi \times 10^{-7}$ T M A^{-1}

$$B = \frac{4\pi \times 10^{-7} \times 10\,00 \times 8}{0.8}$$

$= 2.5 \times 10^{-2}$ T.

M·g field strength = 6.55
= 6.5 × 15 - 45
Speed of electron 4.8 × 10^5 m/s
charge on electron = 1.6 × 10^-19
Mass of electron = 9.1 × 10^-31 kg

θ = 90
relation for mg force:
= $F = quB \sin\theta$.
$F_c = F$

$\frac{mv^2}{r} = quB \sin\theta$

$r = \frac{mv}{qB\sin\theta}$ $r = \frac{mc}{qvB\sin\theta}$

$= \frac{9.1 \times 10^{-31} \times 0.8 \times 10^{5}}{6.5 \times 10^{-4} \times 1.6 \times 10^{-19}}$ = 4.2 × 10
= 4

Mass of electron = 9.1 × 10^-31
Speed " " = 4.8 × 10^6 m/s
radius = r = 4.2
0.042 m
Angular frequency of electron:
$\omega = 2\pi v$
Velocity of electron is related to angular frequency: $v = r\omega$

$\frac{mv^2}{r} = qvB$

$qB = \frac{mv}{r} = \frac{m(r\omega)}{r} = \frac{M(r \cdot 2\pi v)}{r}$

$v = \frac{Bq}{2\pi m}$

$V = \frac{6.5 \times 10^{-4} \times 1.6 \times 10^{-19}}{~~2 \times 3.14 \times 0.1 \times 10^{-3}~~}$

$= 1.82 \times 10^{6}$ Hz

$= 18$ MHz

no. of turns = 30
radius = 8.0 m
Area = $(0.08)^2 \pi$
= 0.0201 m2
Current = 6.0 A
Mg field strength] T
angle = 60
$\tau = nI\,BA \sin\alpha$
$30 \times 6 \times 1 \times 0.0201 \times \sin 60$
= 3.130 Nm

it can be defined from relation $\tau = NIBA \sin\theta$ that of magnitude applied torque not dependent on shape.
Of coil, it is depends on area of coil. answer | could change if circular coil in blue above case is replaced by a plane coil of same irregular shape that in shape the same area.

Radius of coil = 0.16 m > 16 m.
= no. of turn coil = 20
Current " (A
radius of second coil = 10 m.
current " " " = 0.1 m.
= 60 A
no. of turns " " = 25

Mg field $B_1 = \frac{\mu_0 N I_1}{2 \pi l}$

$B_1 = \frac{4\pi \times 10^{-7} \times 20 \times 6}{2 \times 0.10}$

$= 4\pi \times 10^{-4}$ T (pul cool)

$B_2 = \frac{4\pi \times 10^{-7} \times 2? \times 18}{2 \times 0.10}$

$= 9\pi \times 10^{-4}$ T (towards ulu?)

$B = B_2 - B_1 = 4\pi \times 10^{-4}$ T $- 4\pi \times 10^{-4}$ T

$= 5\pi \times 10^{-4}$ T

$= 5 \times 3.14 \times 10^{-4}$

$= 1.57 \times 10^{-5}$ T C.

15. Mg field strength = 100 cu

$= 100 \times 10^{-4}$ T

no. of turns percent = 1000

Current = 15 A.

permeability $\mu_0 = 4\pi \times 10^{-7}$ T m/A

$B = \frac{\mu_0 N I}{l}$

$\frac{N I}{l} = B / \mu_0$

$= (100 \times 10^{-4}) / (4\pi \times 10^{-7})$

$N I / l = 7961$

Solent current $I = 10$ A

$= 1.0$ A

$\frac{N \times 10}{0.5} \times 79.61 = N = 398$ turn

$= 400$

7. Inner radius r_1 = 25 cm = 0.25 m
Outer radius r_2 = 26 cm = 0.26 m.
no. of turns = 500 turns.
Current = 11 A.

a.) M.g field inside torque is zero.
b.) inside cus of porod
Mag induction $= B = \frac{\mu_0 N I}{l}$

$l = 2\pi \frac{(\text{radius})}{2}$

$\pi(r_1 + r_2) = \pi(0.25 + 0.26)$
$= \pi \times 0.51$

$B = \frac{\mu_0 N I}{l}$

$B = \frac{4\pi \times 10^{-7} \times 3500 \text{ Ni}}{\pi \times 0.51}$

$= 3.02 \times 10^{2}$ T.

a.) Partied velocity is parallel or anti parallel
to mag field there B no.
Mg force acting on
particle it moves
not deflected

b.) yes because mag force can change
Velocity but not
magnitude.

it should be is vertically downward direction

M.g field = 0.15
P.D = V = 2.0 kV
electron gas K.E.
$e = 1/2\ mv^2$
$eV = 1/2\ mv^2$

$v = \sqrt{\frac{2eV}{m}}$ $\quad v = \sqrt{\frac{2 \times 1.6 \times 10^{-19} \times 2 \times 10^{2}}{9.1 \times 10^{-31}}}$

$= 2.652 \times 10^{7}$ m/s

$F_1 = eVB$

$F_2 = \frac{mv^2}{r}$

$F_1 = F_2$

$eVB = \frac{mv^2}{r}$

$r = \frac{mv}{eB}$

$r = \frac{9.1 \times 10^{-31} \times 2.652 \times 10^{-7}}{1.5 \times 1.6 \times 10^{-19}}$

$= 10^{-3}$ m $=$ 1 mm.

b) applied force i) initial to initial velocity which is resolved into two component. $V \cos$ as $V \sin \theta$, $V \cos \theta$ along direction of field. It caused electrons to move the straight. That cause electrons to move is circular.

$r = \frac{mv \sin \theta}{Be}$

$r = \frac{9.1 \times 10^{-31} \times 2.65 \times 1.7 \times 2.2 \times 10^{7}}{0.15 \times 1.6 \times 10^{-19}} = 10^{-4}$

$= 50.25 \times 10^5 m$

$r = 0.5 m.$

20.) Mg field = 0.75 T.

V = 15 KV = 15×10^3 V.

Electrostatic field = 9.0×10^5 ml

$1 ev = \frac{1}{2} mv^2$

$ev = \frac{1}{2} mv^2$

mass of electron = m

charge of e = c

Velocity = V

$ee = evB.$

$V = E/B.$

$\frac{1}{2} m (q/B)^2 = ev$

$e/m = E^2/2VB^2$

$$\frac{(1.0 \times 10^5)^2}{2 \times 5000 \times (0.75)^2}$$

$= 4.8 \times 10^7 C/kg$

beam Conduct deflection zone

24.)

a.) torque ⇒ IA > y = B>

T > = 50×10^{-4}

B> = 0.3 K

$T = 12 \times (50 \times 10^{-4}) \, 0.3$

$= 1.8 \times 10^{-2}$ J/Nm

torque is 1.8×10^{-2} N along negative y direction

) 1.8×10^{-2} Nm along negative y
direction net force = 0.

) A is normal to x - z plane
$\vec{A} = -50 \times 10^{-4}$
$\vec{B} = 0.3K$
$\vec{\tau} = -12 \times (-5.0 \times 10^{-4})\, 0.3\,12$
$= 1.8 \times 10^{-5}$ INN.

) $T = 12 \times 50 \times 10^{-4} \times 0.3$
1.8×10^{-2} Nm

A is normal to coil, makes an angle of 30°
with y axis is will make angle
of 30°
with positive x axis is negative
y direction B is directed
along x = axis.
angle between A
and B = 90

is normal by X - Y plane B
positive Z direction
$\vec{A} = 50 \times 10^{-4} K$
$\vec{B} = 0.3K$
$\Rightarrow = 12 \times (-50 \times 10^{-4})K \cdot 0.3K$
$= 0$
∴ torque
required zero force = 0

ẞ- A is normal x-y plane
is negative z direction
$\vec{A} = -50 \times 10^{-4}\hat{k}$
$\vec{B} = 0.21\hat{k}$
$\Rightarrow 12(-50 \times 10^{-4}) \times 0.3\hat{k}$
$= 0$
Dranue = 0
e = Correspond to stable
f = Correspond to unstand requeel

) Resis of galvon meter
= coil = h = 12 ω
current = I = 3mA.
$R = (V/I_g) - G$
$\frac{18}{3 \times 10^{-3}} = 12\,\Omega \Rightarrow 6000 = 12$
$= 5988$ ω
a galvanometre can be convered to voltmeter
by connecting resistor of 5988 ω

Resistan of galvonometer = G = 1ω
Current through it = I_g
$= 4\,mA = 4 \times 10^{-3}$

Ammeter = 0 to 6

$S = \frac{I_g G}{...}$

$\frac{I - I_g}{I - I}$ $\Rightarrow S = S - \frac{4 \times 1.3 \times 6}{6 - 0.004}$
$= 10 \times 10^{-3}\,\Omega$

$S = 10\,m\Omega$

$A = 10\,m\Omega$ resistance clanave be conoured chener can connected is parallel to galvanometer.