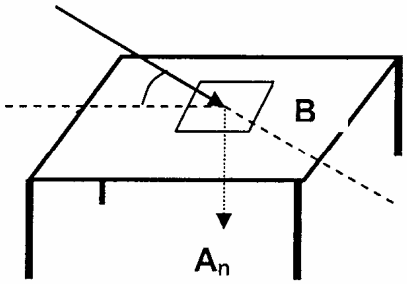
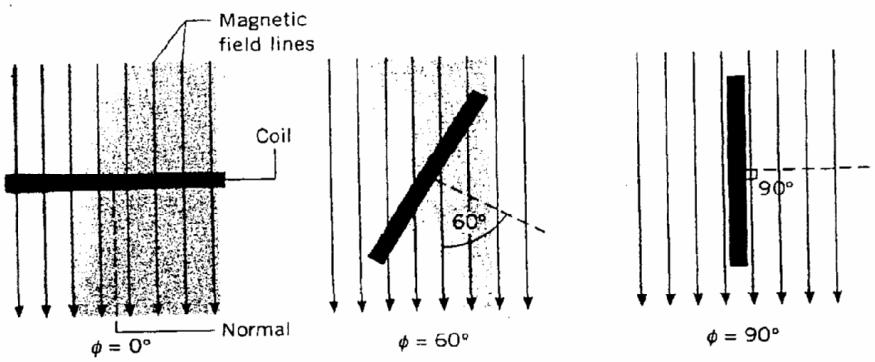
1. A rectangular sheet of paper 21.5 cm by 28 cm rests on a flat table-top. Calculate the magnetic flux through the sheet of paper due to the earth's magnetic field at a location where the fields has a magnitude of 5.31×10^{-5} T and is directed downward at an angle of 37^0 from horizontal.
(Answer : 1.92 X 10^{-6} T.m^2)



2. A solenoid 0.5 m long has turns 400 on it and is wound of 3.0 cm radius. If the current in the solenoid is 5A.
   (a) Find the magnetic field at the center of solenoid.
   (b) Find the magnetic flux through the loop if its area of solenoid is slope 30^0 with the center of it axis.
(Answer : 5.03 x 10^{-3} T , 7.11 x 10^{-6} Wb)

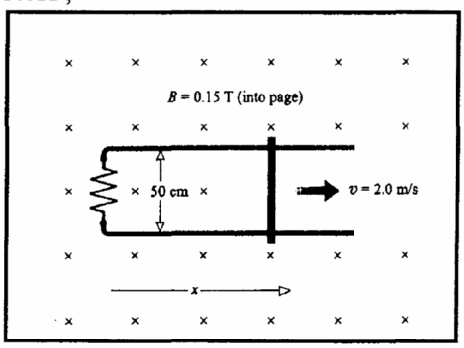
3. A rectangular coil of wire is situated in a constant magnetic field whose magnitude is 0.5 T. The coil as an area of 2.0m^2. Determine the magnetic flux for the three orientations, shown in figure below.
(Answer : 1 Wb , 0.5Wb, 0 Wb)



4. Two loops A and B are placed in the same uniform magnetic field. Loop A has an area of 20cm^2, and its normal makes an angle of 37^0 with the field. Loop B is perpendicular to the field. If the magnetic flux is the same through both loops, find the area of a loop B.
(Answer : 16 cm^2)

5. As shown in figure below, a metal rod makes contact with a partial circuit and completes the circuit. If the resistance is 3.0Ω ,

a. find the emf induce in the rod
b. current induced in the circuit
c. the direction of current induced.



(Answer : 0.15V , 0.05A , CCW)

6. A circular loop of wire has a radius of 5 cm (5×10^{-2} m). The loop with 50 turns is placed in a constant magnetic field 2mT. (*for each condition sketch the diagram to show the orientation of magnetic field and loop plane*)

(a) Find the total magnetic flux on loop when the magnetic field strength and the plane of loop makes an angle of
   i. 50^0
   ii. 90^0
   iii. 60^0
   (Answer : 6.0×10^{-4} Wb, 7.85×10^{-4} Wb, 6.8×10^{-4} Wb,)

(b) Find average induced EMF over a 0.005 s when the coil change from a(i) to a(ii).
   (Answer : -0.037 V)

7. A electric generator has 10 turns of wire, each enclosing an area of $0.050 m^2$, rotating in a uniform magnetic field perpendicular to an axis of rotation. It produce an emf in volt described by an equation $\varepsilon = -50 \sin(60\pi t)$.

(a) Find the angular velocity and the frequency of rotation of this generator.
(b) Find the maximum value of the emf.
(c) Find the magnitude of magnetic field.

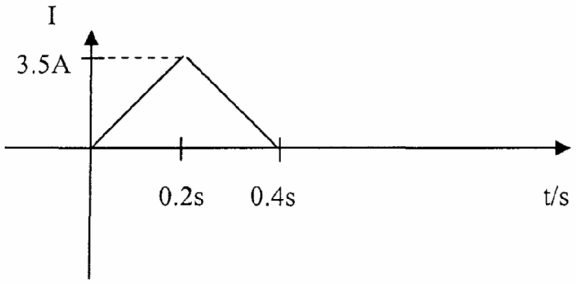
(Answer : 60π rad/s, 30 Hz , 50V , 0.5.3 T.)

8. A rectangular coil of 50 turns with dimension of 5 cm x 8 cm is placed in uniform field of a magnet with B = 100mT. if the coil plane make an angle of 10^0 with the field,

(a) Find the magnetic flux on the coil.
(b) If the current 5A is flow through the coil, find the torque on coil when the field makes an angle 40^0 and 0^0 with the coil.
(c) The current is cut out from coil and the coil is rotated at the axis at 200 r.p.m . Find the maximum emf induced and write down the equation with show the relation between emf induced and time.

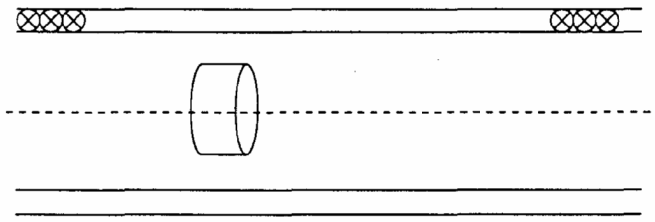
(Ans : (a) 6.95×10^{-5} Wb, (b) 0.0766 Nm , 0.1 Nm , (c) 0.419V , 0.419 sin $20\pi/3$ t)

9. A sphere coil of 2 turns is placed coaxial inside a solenoid of 900 turns per unit meter length as shown below. The coil has a area of $14cm^2$. A current in solenoid are increased from zero to 3.5A in 0.2s and reduced from 3.5A to 0A in 0.2s changed as shown in graph below.



(a) Find magnetic flux density produced at the center axis of solenoid when current is 3.5A.
(b) Sketch the graph for changes of magnetic field in solenoid versus time.
(c) Find magnetic flux on the coil in 0.2s
(d) Sketch the graph for changes of magnetic flux on coil versus time.
(e) Find the magnitude of in the coil in first 0.2s.
(f) Identify the direction of current induced in the coil.
(g) Identify the direction of current induced in the after current are reduced.
(h) Sketch the graph for changes of e.m.f induced in coil versus time.

(Answer : a. 3.96×10^{-3} T, c. 5.54×10^{-6}Wb , e. -5.4×10^{-5} V , f. counterclockwise , g. clockwise)



10. When the current in a certain coil is changing at a rate of 3.0 A/s, it found that an emf of 7 mV is induced in anearby coil. What is the mutual inductance of the combination?
(Ans: 2.3 mH)

11. Two coils are wound on the same iron rod so that the flux generated by one passes through the other also. The primary coil has N_p loops and when a current of 2.0 A flows through it, the flux in it is 2.5×10^{-4} Wb. Detemine the mutual inductance of the two coils if the secondary coil has 100 loops.
(Ans: 0.013 H)