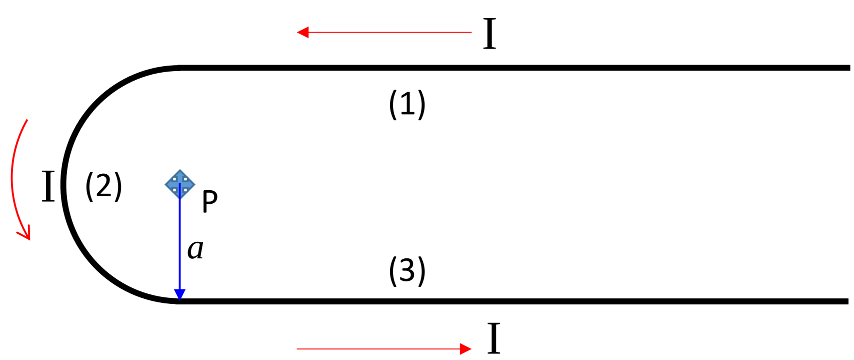
Sheet 11

(1) Determine the magnetic flux density of a straight current filament of length L and current intensity I.

(2) Determine the magnetic flux density at any point on the axis of a circular current loop of radius ***a*** flown by current I.

(3) Determine the magnetic flux density at a point P of a straight pieces of current carrying wire shown in the figure of length L, and a current carrying semi-circle of radius ***a*** =5cm for **I**= 2A.



(4) a) A filament is formed into a circle of radius ***a***, centered at the origin in the plane z = 0. It carries a current I in the a_φ direction. Find H at the origin.
b) A filament of the same length is shaped into a square in the z = 0 plane. The sides are parallel to the coordinate axes and a current I flows in the general a_φ direction. Again, find H at the origin.

(5) Let a filamentary current of 5 mA be directed from infinity to the origin on the positive z axis and then back out to infinity on the positive x axis. Find: H at M (0, 1, 0)

(6) a) Find H in Cartesian components at P (2, 3, 4) if there is a current filament on the z axis carrying 8mA in the a_z direction.
b) Repeat if the filament is located at x = −1, y = 2.
c) Find H if both filaments are present

(7) An infinite filament on the z axis carries 20π mA in the a_z direction. Three a_z-directed uniform cylindrical current sheets are also present: 400 mA/m at ρ = 1 cm,

-250 mA/m at ρ = 2 cm and -300 mA/m at ρ = 3 cm. Calculate H at ρ = 0.5, 1.5, 2.5, and 3.5 cm.

(8) The cylindrical shell, 2mm < ρ < 3mm, carries a uniformly-distributed total current of 8A in the $-a_z$ direction, and a filament on the z axis carries 8A in the a_z direction. Find H everywhere

(9) A conducting filament at $\rho = 0$ carries 12 A in the a_z direction. Let $\mu_r = 1$ for $\rho <$ 1 cm, $\mu_r = 6$ for 1 < ρ < 2 cm, and $\mu_r =1$ for ρ > 2 cm. Find

a) H everywhere

b) B everywhere

(10) Point P (2, 3, 1) lies on the planar boundary separating region 1 from region 2. The unit vector $a_{N12} = 0.6a_x + 0.48a_y + 0.64a_z$ is directed from region 1 to region 2. Let $\mu_{r1} = 2$, $\mu_{r2} = 8$ and H_1=100ax - 300ay + 200az A/m. Find H_2

(11) Let $\mu_{r1} = 2$ in region 1, defined by 2x + 3y - 4z > 1, while $\mu_{r2} = 5$ in region 2 where 2x + 3y - 4z < 1. In region 1, $H_1 = 50a_x - 30a_y + 20a_z$ A/m.

Find:

a) H_{N1} (normal component of H_1 at the boundary)

b) H_{T1} (tangential component of H_1 at the boundary)

c) H_{T2} (tangential component of H_2 at the boundary)

d) H_{N2} (normal component of H_2 at the boundary)

e) θ_1, the angle between H_1 and a_{N21}

f) θ_2, the angle between H_2 and a_{N21}

(12) Three planar current sheets are located in free space as follows:

$-100a_x$ A/m at z = -1, $200a_x$ A/m at z= 0, $-100a_x$ A/m at z = 1.

Let w_H = (1/2) B. H J/m^3, then find w_H for all z.