ARAB ACADEMY FOR SCIENCE & TECHNOLOGY & MARITIME TRANSPORT
COLLEGE OF ENGINEERING & TECHNOLOGY
Electronics and Communications Department

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Electromagnetics
Course # EC341
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Sheet (6)

1. Find H at the center of a square current loop of side L.

2. A current filament of 5A in the +y direction is parallel to the y-axis at x = 2m, z = 2m. Find $\overline{H}$ at the origin.

3. A current sheet with $\overline{J_{s1}}$ = 10 $\hat{a}_z$ A/m lies in the plane x = 5 m and a secondary sheet with $\overline{J_{s2}}$ = –10 $\hat{a}_z$ A/m is at x = –5 m. Find $\overline{H}$ in all regions

4. In cylindrical coordinates, the current density is given by:

   $\overline{J} = 4.5\, e^{-2rc}\, \hat{a}_z$ A/m^2 $\quad 0 \le r_c \le 0.5$ m
   $\overline{J} = 0$ A/m^2 $\quad$ Elsewhere

   Use Ampere's law to find $\overline{H}$ in all regions.

5. Two identical circular current loops of radius r_c = 3m and I = 20A are in parallel planes separated on their common axis by 10m. Find $\overline{H}$ at the midway point between the two loops.

6. In Cartesian coordinates a constant current density J = $J_o\, \hat{a}_y$ A/m^2 exists in the region –a ≤ z ≤ a. Find $\overline{H}$ in all regions

7. The regions 0 ≤ z ≤ 0.1 m and 0.3 ≤ z ≤ 0.4 m are conducting slabs carrying uniform current densities of 10 A/m^2 in opposite y directions. Find $\overline{H}$ at z =0.06, 0.26 and 0.36m

8. Let H = $-y(x^2 + y^2)\,\hat{a}_x + x(x^2 + y^2)\,\hat{a}_y$ A/m in the z = 0 plane for –5 ≤ x ≤ 5 and –5 ≤ y ≤ 5 m. Find the total current passing through z = 0 plane in the $\hat{a}_z$ direction inside the rectangle –1 ≤ x ≤ 1 and –2 ≤ y ≤ 2 m by two different methods.

9. A cylindrical conductor of infinite length and radius 10^{-2} m, along the z-axis, has an internal $\vec{H}$, where

$$\overline{H} = 4.77 \times 10^4 \left(\frac{r_c}{2} - \frac{r_c^2 \times 10^2}{3} \right) \hat{a}_\varphi \text{ A/m} \qquad 0 \le r_c \le 10^{-2} \text{ m}$$

   Find I by two methods.