KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

Department of Electrical Engineering

EE 340 Electromagnetic

Homework 8 (Due on Wed., Jan 16, 2008)

1- Two resistors are connected by wires to form a circuit as shown in fig.1-a. The magnetic flux linking the circuit varies with time. Fig 1-b shows the time variation of the magnetic flux. The positive value of the flux corresponds to the flux directed into the paper. The magitude of the flux for a single turn of a circuit loop that encircles the magnetic flux.

(a) Plot the current $I(t)$ versus time. Be sure to make the scale of the currrent.

(b) Plot the voltage $V(t)$ versus time. Make the scale..

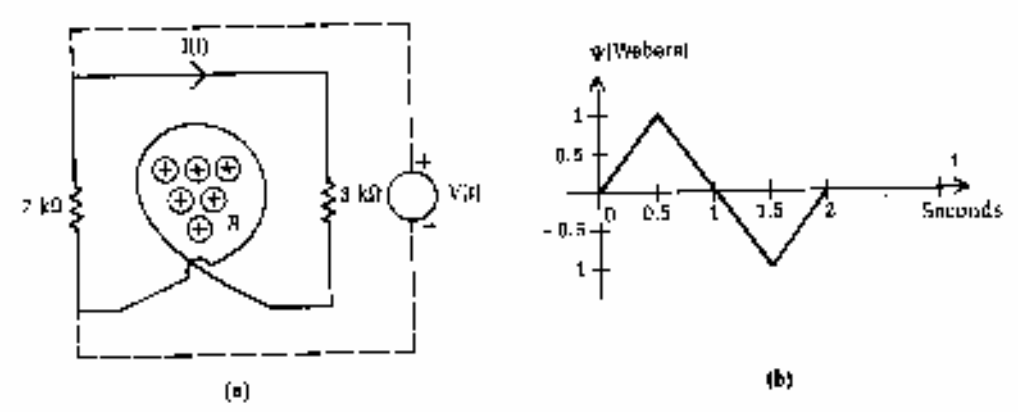
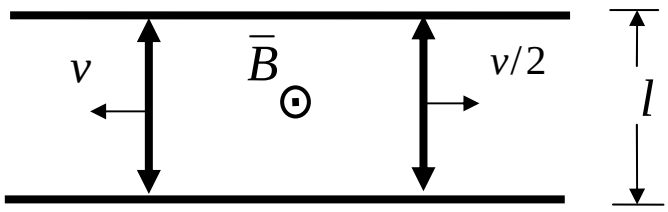


Fig. 1

2- Two parallel wires with separation l have two sliding conductors bridging the wires as shown in Fig. 2. the left hand slider moves to the left with a velocity of v m/s, while the right hand slider moves to the right with a velocity $v/2$. A uniform magnetic field perpendicular to the plane of the wires is given by $B = B_o t^2 \cos 2\omega t$

(a) Find the emf induced in the closed circuit in symbolic form.

(b) Evaluate numerically if $B_o = 3\ T/s^2$, $l = 500\ mm$, $t = 2\ s$, and v= 0.5 m/s. Both sliders are together at $t = 0$, $\omega = \pi/10$.



3- A conductor of length *l* miving with a velocity $\bar{u} = u_o \cos\omega t\, \hat{a}_y$ m/s is connected with flexible leads to a voltmeter, as shown ib Fig.3 . If the magnetic flux density in the region is $\bar{B} = B_o \cos\omega t\, \hat{a}_x$ Tesla, determine the induced emf in the circuit.

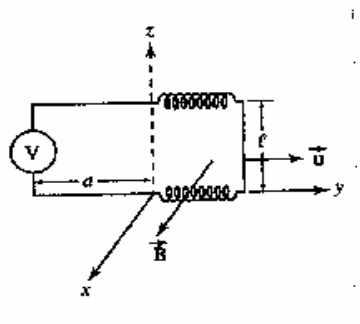


Fig. 3

4- A conducting sliding bar oscillates over two parallel conducting reils in a sinusoidally varying magnetic field $\bar{B} = 5\cos\omega t\, \hat{a}_z$ (*mT*) as shown in Fig. 4. The position of the sliding bar is given by $x = 0.35(1-\cos\omega t)$ (*m*), and the rails are terminates by a resistance $R = 0.2\ \Omega$. Find *i*.

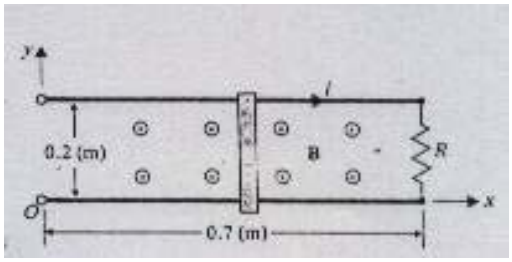


Fig. 4

5- The loop shown in Fig. 5 is inside a uniform magnetic field $\bar{B} = 50\, \hat{a}_x$ *mW/m*^{2}. If the side Dc of the loop cuts the flux kines at a frequency of 50 Hz and the loop lies in the *yz*-plane at the time $t = 0$, find

(a) the induced eemf at *t* = 1 *ms*.

(b) The induced current at *t* = 3 *ms*.

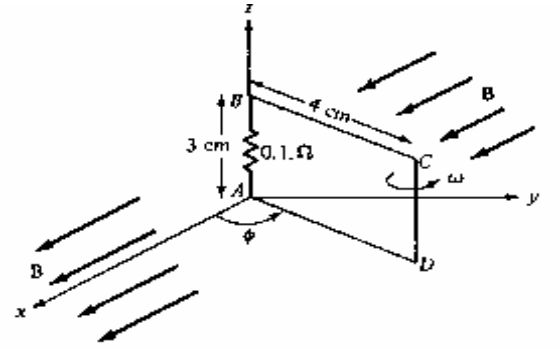


Fig. 5