TUTORIAL-11

PRE-TUTORIAL ASSIGNMENT- SOLUTION

Solution:

(a)

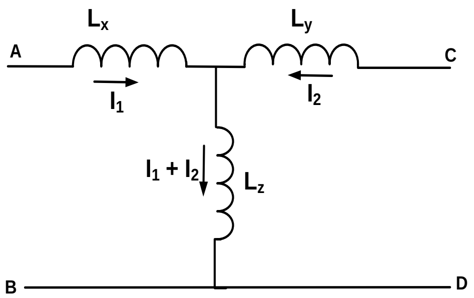


Fig. 1(a)

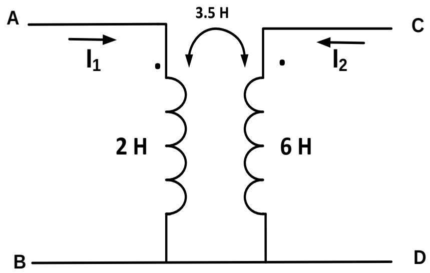


Fig. 1(b)

From Fig. 1(a) we can write,

$$V_{AB} = L_x I_1 + L_z I_1 + L_z I_2$$
$$V_{CD} = L_y I_2 + L_z I_1 + L_z I_2$$

From Fig. 1(b) we can write,

$$V_{AB} = 2I_1 + 3.5I_2$$
$$V_{CD} = 6I_2 + 3.5I_1$$

From the above equations we can write,

$$L_x + L_z = 2$$
$$L_z = 3.5\ H$$
$$\Rightarrow L_x = -1.5\ H$$
$$L_y + L_z = 6$$
$$\Rightarrow L_y = 2.5\ H$$

(b) If the dot in the secondary of Fig. 1(b) is reversed than the equations will be,

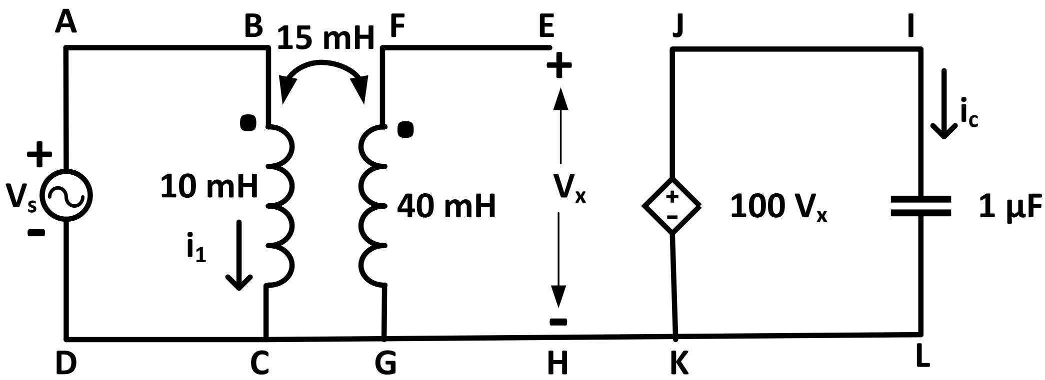
$$V_{AB} = 2I_1 - 3.5I_2$$
$$V_{CD} = 6I_2 - 3.5I_1$$

From the above equations we can write,

$$L_x + L_z = 2$$
$$L_z = -3.5\ H$$
$$\Rightarrow L_x = 5.5\ H$$
$$L_y + L_z = 6$$
$$\Rightarrow L_y = 9.5\ H$$

TUTORIAL-11: SOLUTIONS

Solution-1:



Applying KVL in the loop ABCDA

$$\frac{10t^2}{t^2+0.01} = 10\times10^{-3}\frac{di_1}{dt}$$

$$\Rightarrow \frac{di_1}{dt} = \frac{1000t^2}{t^2+0.01}$$

There will be an induced voltage in 40 mH coil due to the current i_1 in 10 mH coil. Applying KVL in the loop EFGHE

$$15\times10^{-3}\frac{di_1}{dt} = V_x$$

$$\Rightarrow V_x = \frac{15t^2}{t^2+0.01}$$

Applying KVL in the loop LKJIL

$$100V_x - \frac{\int i_c dt}{C} = 0$$

$$\Rightarrow i_c = 100C\times\frac{dV_x}{dt} = \frac{0.03t}{(t^2+0.01)^2}\ mA$$

Solution-2: $Z_{in} = R_s + j\left(\omega L_s - \dfrac{1}{\omega C_s}\right)$ At $\omega = 45krad/s,\quad Z_{in} = 65.4\angle -40.2^\circ$

$$\frac{Z_c}{R} = \frac{1}{\omega CR} = \frac{1}{45\times10^{-4}\times50} = 4.44$$

Maximum value of current will flow when the impedance is minimum. The impedance will be minimum when

$\left(\omega L_s - \dfrac{1}{\omega C_s}\right) = 0$, Hence

$\omega = \dfrac{1}{\sqrt{LC}} = 50krad/s$ and the corresponding $f = \dfrac{\omega}{2\pi} = 7.96kHz$

Solution-3:

Decimal x	Binary I\P			y_4	y_3	y_2	y_1	y_0
	x_2	x_1	x_0					
0	0	0	0	0	0	0	1	0
1	0	0	1	0	0	1	0	1
2	0	1	0	0	1	0	0	0
3	0	1	1	0	1	0	1	1
4	1	0	0	0	1	1	1	0
5	1	0	1	1	0	0	0	1
6	1	1	0	1	0	1	0	0
7	1	1	1	1	0	1	1	1

By observation

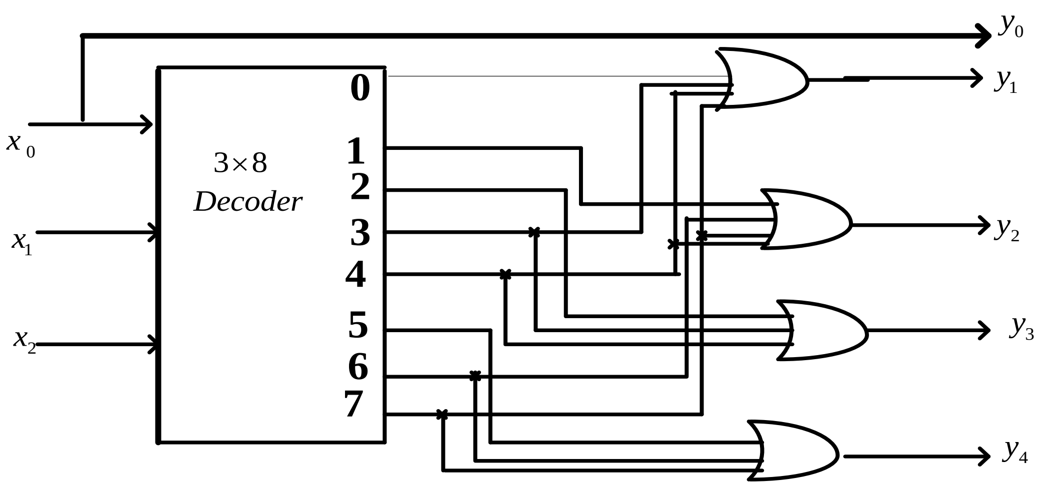
$$y_0 = x_0$$

$$y_1 = \sum m(0,3,4,7)$$

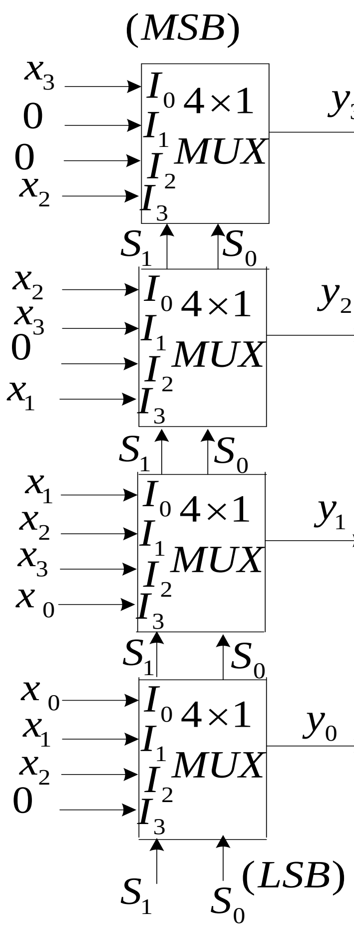
$$y_2 = \sum m(1,4,6,7)$$

$$y_3 = \sum m(2,3,4)$$

$$y_4 = \sum m(5,6,7)$$



Solution-4: Let input 4 bit string be MSB x_3, x_2, x_1, x_0 LSB



S_1	S_0	MUX
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

y_3	y_2	y_1	y_0
x_3	x_2	x_1	x_0
0	x_3	x_2	x_1
0	0	x_3	x_2
x_2	x_1	x_0	0