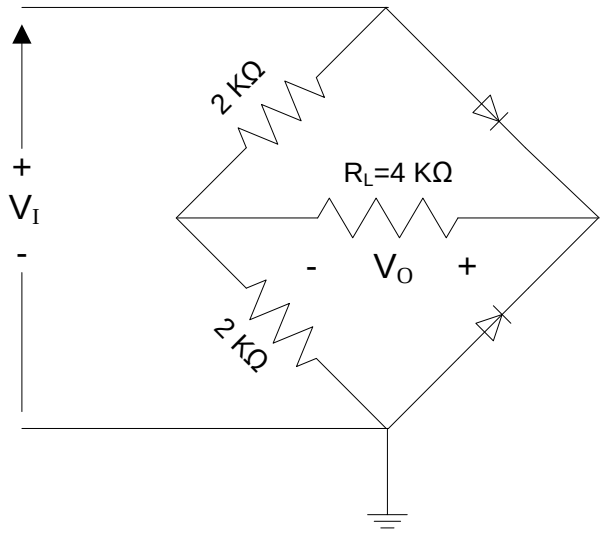
EE101: QUIZ-1 (Solution)

1.

(a)



For $-1.4V \le V_I \le 1.4V$, no current will flow through R_L. Therefore, we will have V_O=0 for $-1.4V \le V_I \le 1.4V$ **[1]**

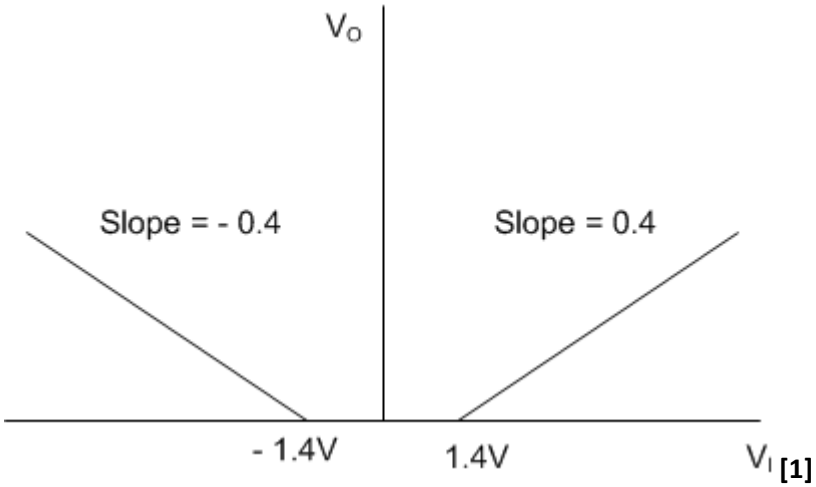
For V_I > 1.4V,

$$\frac{V_I - (V_I - 0.7 - V_O)}{2} + \frac{V_O}{4} = \frac{V_I - 0.7 - V_O}{2}$$

$V_O = 0.4V_I - 0.56$ **[1]**

Similarly, for V_I <-1.4V, $V_O = -0.4V - 0.56$ **[1]**

(b)

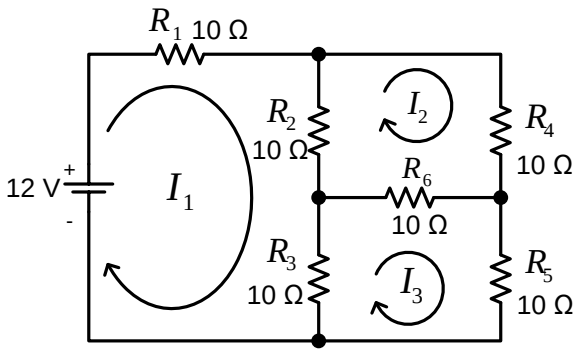


[1]

(c) This circuit also does full wave rectification but its output will be lower than that of the bridge circuit. The DC output of this circuit will be approximately 0.4 of what one would get from a bridge rectifier using four diodes even when the voltage applied is much larger than 1.4V. **[1]**

Give only ½ mark if the factor 0.4 is not mentioned

2.



a.

i. Current in $R_1 = I_1$, in the direction of I_1.

ii. Current in $R_2 = I_1 - I_2$, in the direction of I_1.

iii. Current in $R_3 = I_1 - I_3$, in the direction of I_1.

iv. Current in $R_4 = I_2$, in the direction of I_2.

v. Current in $R_5 = I_3$, in the direction of I_3.

vi. Current in $R_6 = I_2 - I_3$, in the direction of I_2.

[0.25 mark for each correct answer.]

b. KVL equations:

i. Mesh- 1:

$$10I + 10(I_1 - I_2) + 10(I_1 - I_3) = 12$$
$$\Rightarrow 30I_1 - 10I_2 - 10I_3 = 12$$
$$\Rightarrow 3I_1 - I_2 - I_3 = 1.2 \quad -----(1)$$

ii. Mesh – 2:

$$10(I_2 - I_1) + 10I_2 + 10(I_2 - I_3) = 0$$
$$\Rightarrow -10I_1 + 30I_2 - 10I_3 = 0$$
$$\Rightarrow 3I_2 = I_1 + I_3 \quad -------(2)$$

iii. Mesh – 3:

$$10(I_3 - I_1) + 10(I_3 - I_2) + 10I_3 = 0$$
$$\Rightarrow -10I_1 - 10I_2 + 30I_3 = 0$$
$$\Rightarrow I_1 + I_2 = 3I_3 \quad -------(3)$$

[0.5 mark for each correct equation. 2 mark if all three equations are correct]

c. Solving (1), (2) and (3) we get,

$I_1 = 0.6A, I_2 = 0.3A, I_3 = 0.3A.$ (Answer)

[0.5 **mark for each correct answer.]**