



**Indian Institute of Information Technology, Sri City, Chittoor**  
(An Institute of National Importance under an Act of Parliament)

---

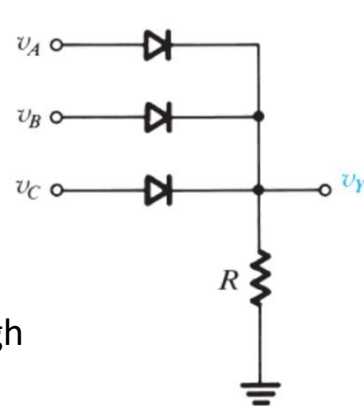
# BEC Tutorial 2

Dr. Kandimalla Divyabramham  
Assistant Professor  
IIIT Sri City

---

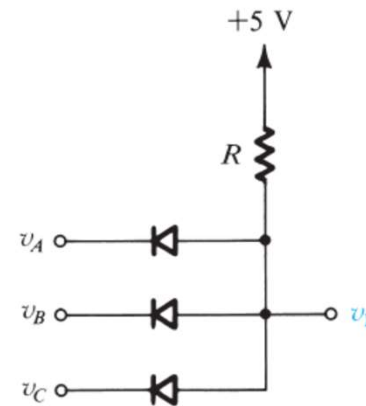
# Diode Logic Gates

- What type of logic can be implemented using the below circuits, High (+ 5 V) represents logic 1 and low (0 V) represents logic 0.



Ans for (a): OR gate, any one input is high (diode is on)  $v_Y = +5\text{ V}$ .

(a)



(b)

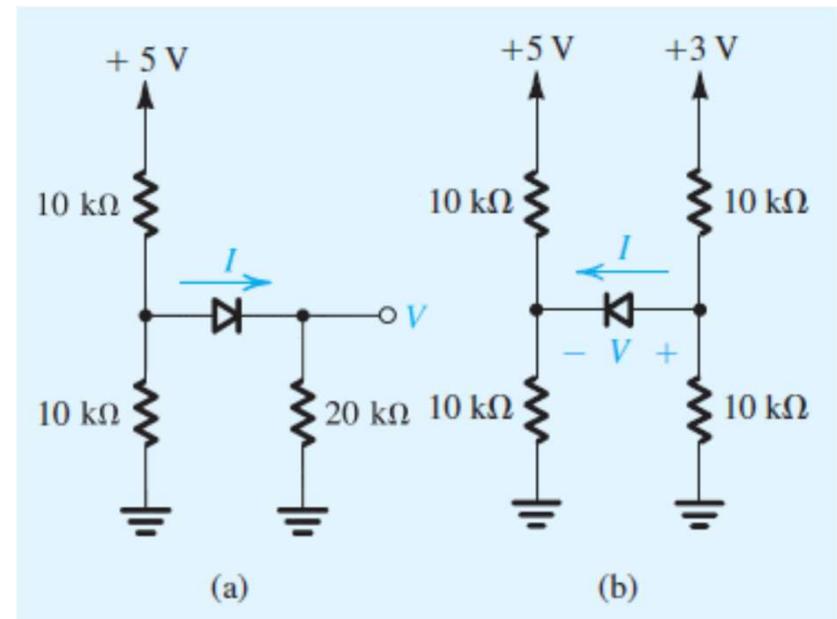
Ans for (b): And gate, if any one of the input is low  $v_Y = 0$ , and all the inputs are high then  $v_Y = \text{high}$ .

# Ideal diode circuit

- Assuming that the diodes in the circuits of Fig. are ideal, utilize Thevenin's theorem to simplify the circuits and thus find the values of the labeled currents and voltages.

Ans for (a): Diode is on, and  $V = 2\text{ V}$  and  $I = 0.1\text{ mA}$ .

Ans for (b): Diode is off, and  $V = -1\text{ V}$  and  $I = 0\text{ mA}$ .

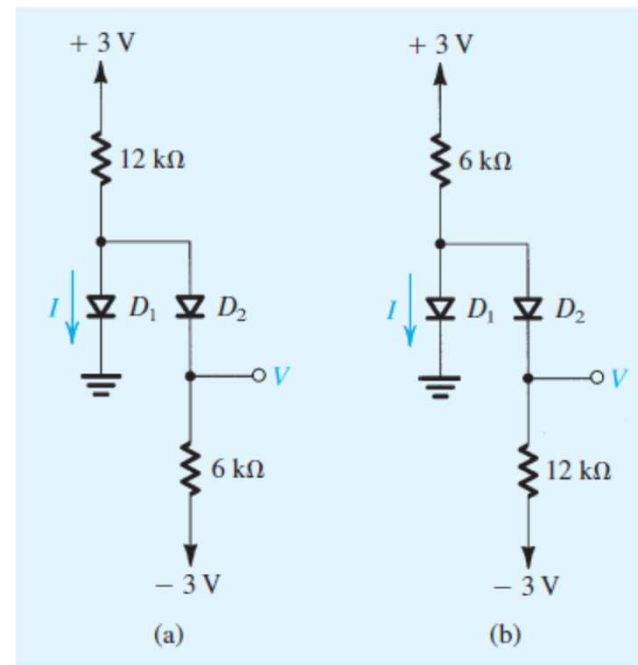


# Ideal diode circuit

- Assuming that the diodes in the circuits of Fig. are ideal, find the values of the labeled currents and voltages.

Ans for (a): D1 is off and D2 is on, and  $V = -1\text{ v}$  and  $I = 0$ .

Ans for (b): D1 is on and D2 is on, and  $V = 0\text{ v}$  and  $I = 0.25\text{ mA}$ .



## Terminal char. of diodes

$$I = I_s \left( e^{V/nV_T} - 1 \right) \quad V = V_T \ln \frac{I}{I_s}$$

$$V_T = 0.0862 (273 + T^{\circ}\text{C}) \text{ mV}$$

- At what forward voltage does a diode conduct a current equal to  $10,000 I_s$ ? In terms of  $I_s$ , what current flows in the same diode when its forward voltage is 0.7 V?

Ans :  $V = 0.233 \text{ V}$  ( $n = 1$ ) and  $V = 0.465 \text{ V}$  ( $n = 2$ ), and for  $V = 0.7 \text{ V}$   $I = 10^{12} I_s$  ( $n = 1$ ),  $I = 10^6 I_s$  ( $n = 2$ ).

- A diode fed with a constant current  $I = 1 \text{ mA}$  has a voltage  $V = 690 \text{ mV}$  at  $20^{\circ}\text{C}$ . Find the diode voltage at  $-20^{\circ}\text{C}$  and at  $+85^{\circ}\text{C}$ .

Ans :  $V = 0.473 \text{ mV}$  ( $-20^{\circ}\text{C}$ ) and  $V = 1.1 \text{ V}$  ( $85^{\circ}\text{C}$ ), for  $n = 1$ .

# Zener Diode Problem

---

- A 9.1-V zener diode exhibits its nominal voltage at a test current of 20 mA. At this current the incremental resistance is specified as  $10\ \Omega$ . Find  $V_{Z0}$  of the zener model. Find the zener voltage at a current of 10 mA and at 50 mA.

Ans :  $V_{Z0} = 8.9\text{ V}$ ,  $V_Z = 9.0\text{ V}$  (10 mA) and  $V_Z = 9.4\text{ V}$  (50 mA).