→ KVL is based on Conservation of Charge according to this the algebraic Sum of Current at a node is (zero).

→ Appling KCL at point B

$$\frac{V_b - V_a}{10} + \frac{V_b}{2} + \frac{V_b}{100k} = 0$$

Taking approximation ($\frac{V_b}{100k} << \frac{V_b}{2}$)

$$V_b - 12 + 5V_b = 0$$

$$\frac{6V_b}{6} = \frac{12}{6}$$

$$\therefore V_b = 2V$$

→ So, ⇒ $I_1 = \frac{12-2}{10} = 1A$

⇒ $I_3 = \frac{2}{100k} = 2\times10^{-5} A$ (Ideal diode)

⇒ $I_3 = \frac{2-0.7}{100k} = 1.3\times10^{-5} A$ (For Silicon diode)

⇒ $I_2 = \frac{2}{2} - 2\times10^{-5} \approx 1 A$

→ In Second approximation the diode is Considered as Forward biased diode with battery to turn on the device, Now according to the question each independent Source by 10%.

So, $V_a = 12 + \frac{1}{10}\times12 = 13.2V$

⇒ $R_1 = 10 + 1 = 11\Omega$

⇒ $R_2 = 2 + 0.2 = 2.2\Omega$

⇒ $R_3 = 100k + 10k = 110k\Omega$

or V_b applying KCL

$$\frac{V_b - V_s}{11} + \frac{V_b}{2.2} + \frac{V_b}{110K} = 0$$

(Taking approximation) $\frac{V_b}{100k} << \frac{V_b}{2}$

$$\therefore \frac{V_b}{11} - \frac{13.2}{12} + \frac{V_b}{2.2} = 0$$

$$= \frac{V_b}{11} + \frac{V_b}{2.2} - \frac{13.2}{12} = 0$$

$$= 0.545 V_b - 1.1 = 0$$

$$V_b = \frac{1.1}{0.545}$$

$$\therefore V_b = 2.02 V$$

So,

$V_s = V_a = 13.2V$

$V_b = 2.20V$

$V_c = 2.02V$ → (if diode is ideal)

$V_c = (2.02 - 0.7) = 1.32$ → (if it is Silicon diode)

⇒ The barrier potential of Silicon diode is

⇒ $I_1 = \frac{V_a - V_b}{11} = \frac{13.2 - 2.02}{11} = 1.01636 A$

⇒ $I_3 = \frac{2.02}{100k} = 2.02 \times 10^{-5} A$ → (For ideal diode)

$I_3 = 1.3 \times 10^{-5}$ (For silicon)

⇒ $I_3 = \frac{2.02}{2} = 1.01 A$

⇒ we know power equation $P = I^2 \times R$

$\therefore P_1 = (1.01636)^2 \times 13.2 = 13.635 W$

$P_2 = (1.01)^2 \times 2 = 2.0402 W$

$P_3 = (2.02 \times 10^{-5})^2 \times 110 \times 10^3 = 4.48 \times 10^{-5} W$

$V_s = 12$

13.2   2V

		V_a	V_b	V_c	I_1	I_2	I_3	P_1	P_2	P_3
12 ←	↑ V_s	↑ V_a= [illegible]	↑ V_b= [illegible]	↓ 2.02	↓	↓	Ch ↓	↑	↓	↓
11 ←	↑ R_1	↑ [illegible] تنقص	↓	↓	↓	↓	↓	↑	↓	↓
2.2	↑ R_2	↓	↓	2.2 ↓	↓	↓	↓	↑	↓	↓
110	↑ R_3	↓	↓	↓	↓	↓	↓	↓	↓	↓
0.7	↑ V_K	↑	↑	↑	↑	↑	↑	↑	↑	↑

$V_S = V_K + V_L$