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EE 112

For KCST

EE101 - EE112 - EE211 - EE201 - EE212 - EE312 - EE341 - EE342 - EE351 - EE352 - EE365 - EE410 - EE441 - EE442 - EE443 - EE451

فالكم A

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* Lecture 1 _ Diode *



* Connection ways :

Forward أمامي (ON)	Reverse عكسي (off)
+ الدايود مع موجب البطارية	+ الدايود مع سالب البطارية
- الدايود مع سالب البطارية	- الدايود مع موجب البطارية

* Diode models :

① Ideal diode model

F ⟶ نستبدل الدايود بـ Short circuit

R ⟶ نستبدل الدايود بـ open circuit

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② Parctical diode model (Voltage Drop)

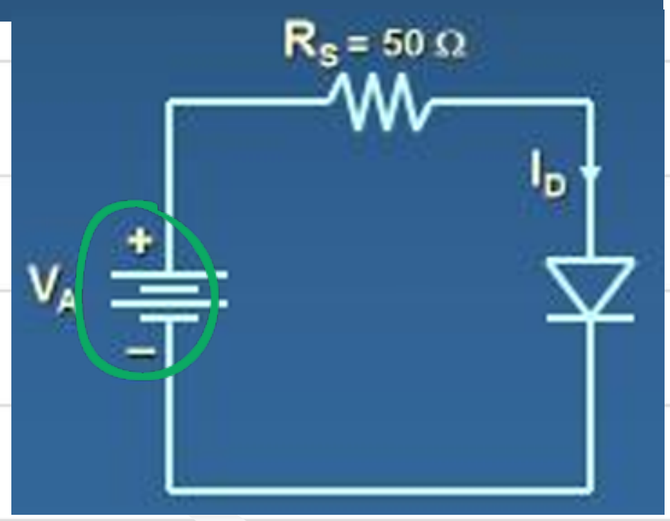
F ⟶ Si 0.7V نستبدل الدايود ببطارية قيمتها

Ge 0.3 V

R ⟶ نستبدل الدايود بـ open circuit

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Example: Assume the diode in the circuit below is ideal. Determine the value of I_D if a) V_A = 5 volts (forward bias) and b) V_A = -5 volts (reverse bias)



5 V

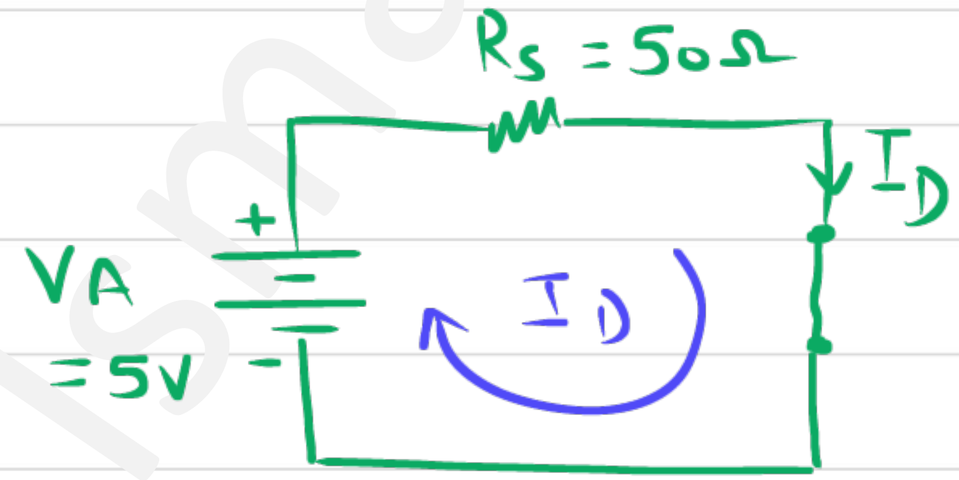
* Sol *

a) $V_A = 5\,V$

$$\therefore I_D = \frac{V_A}{R_S}$$

$$\therefore I_D = \frac{5}{50} = 0.1\ A$$

$$I_D = 100\ mA$$

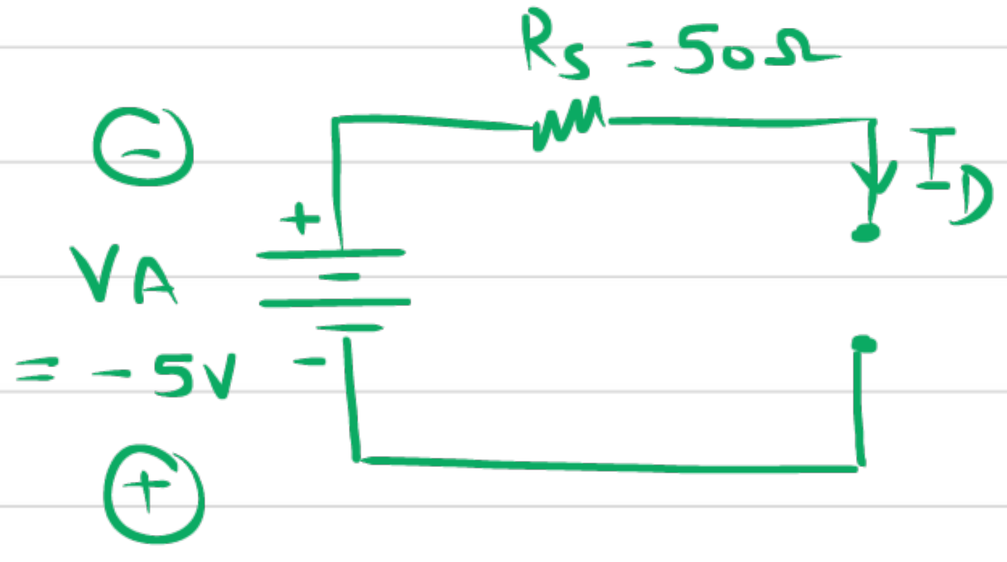


m → $\times 10^{-3}$
μ → $\times 10^{-6}$
n → $\times 10^{-9}$
p → $\times 10^{-12}$
k → $\times 10^{3}$
M → $\times 10^{6}$

b) $V_A = -5\,V$

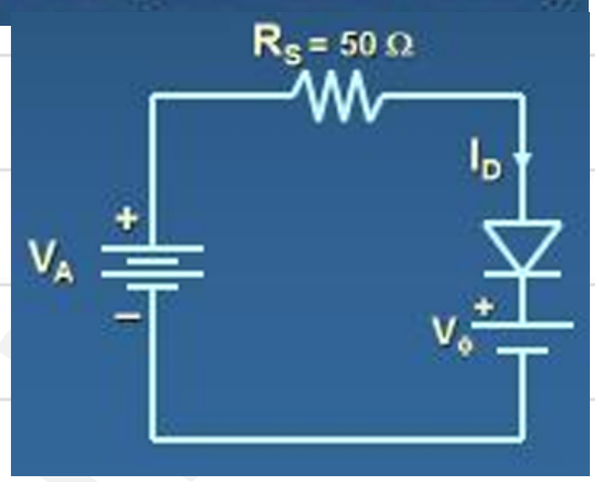
$$I_D = 0$$

open الكرنت لا يمر فى ال

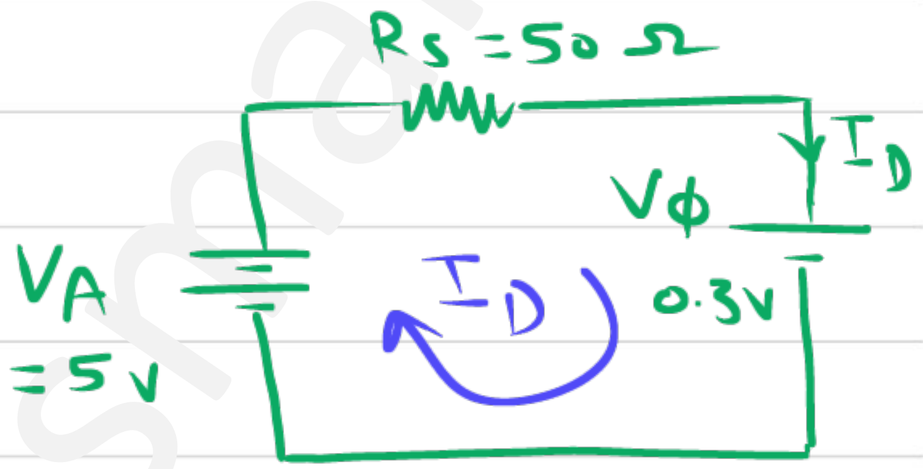


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Example: To be more accurate than just using the ideal diode model include the barrier potential. Assume $V_\phi = 0.3$ volts (typical for a germanium diode) Determine the value of I_D if $V_A = 5$ volts (forward bias).



* Sol *



KVL

$\Sigma V = 0$

$$-V_A + R_S I_D + V_\phi = 0$$

$$-5 + 50 I_D + 0.3 = 0$$

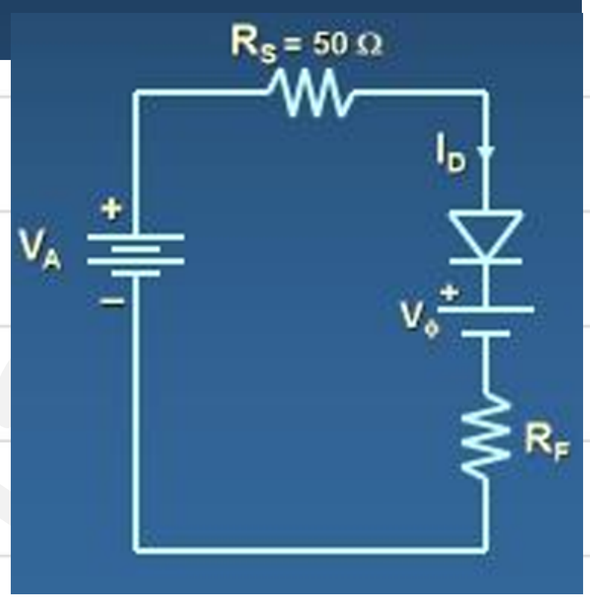
$$50 I_D = 5 - 0.3$$

$$I_D = \frac{5 - 0.3}{50} = 94 \times 10^{-3}\ A$$

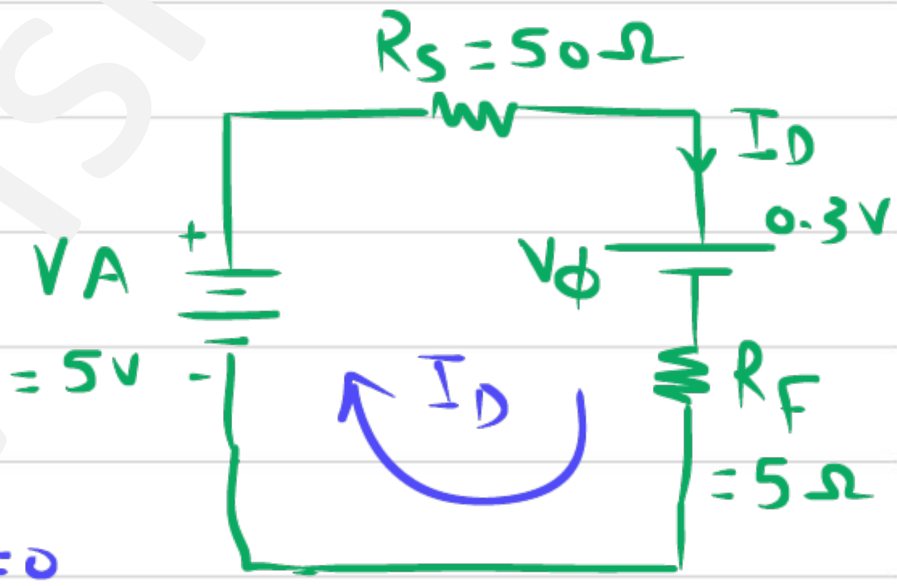
$$I_D = 94\ mA$$

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Example: Assume the diode is a low-power diode with a forward resistance value of 5 ohms. The barrier potential voltage is still: $V_\phi = 0.3$ volts (typical for a germanium diode) Determine the value of I_D if $V_A = 5$ volts.



Sol



KVL

$\Sigma V = 0$

$$-V_A + R_S I_D + V_\phi + R_F I_D = 0$$

$$-5 + 50 I_D + 0.3 + 5 I_D = 0$$

$$(50+5) I_D = 5 - 0.3$$

$$I_D = \frac{5 - 0.3}{50+5} = 85.45 \text{ mA}$$

$\times 10^{-3}$