جامعة بيرزيت

BIRZEIT UNIVERSITY

Electrical and Computer Engineering Department

Analog Electronics – ENEE2360

Quiz1 25/7/2024

Instructor: Mr.Mohammad Al - Jubeh

Student Name: Mohammed Jamil Saada

Student ID: 1221972

10/10

The diode in the circuit shown in Fig.(1) has VK = 0.7V.
Calculate and Plot Vo(t) for Vs(t) =5 sinwt V.

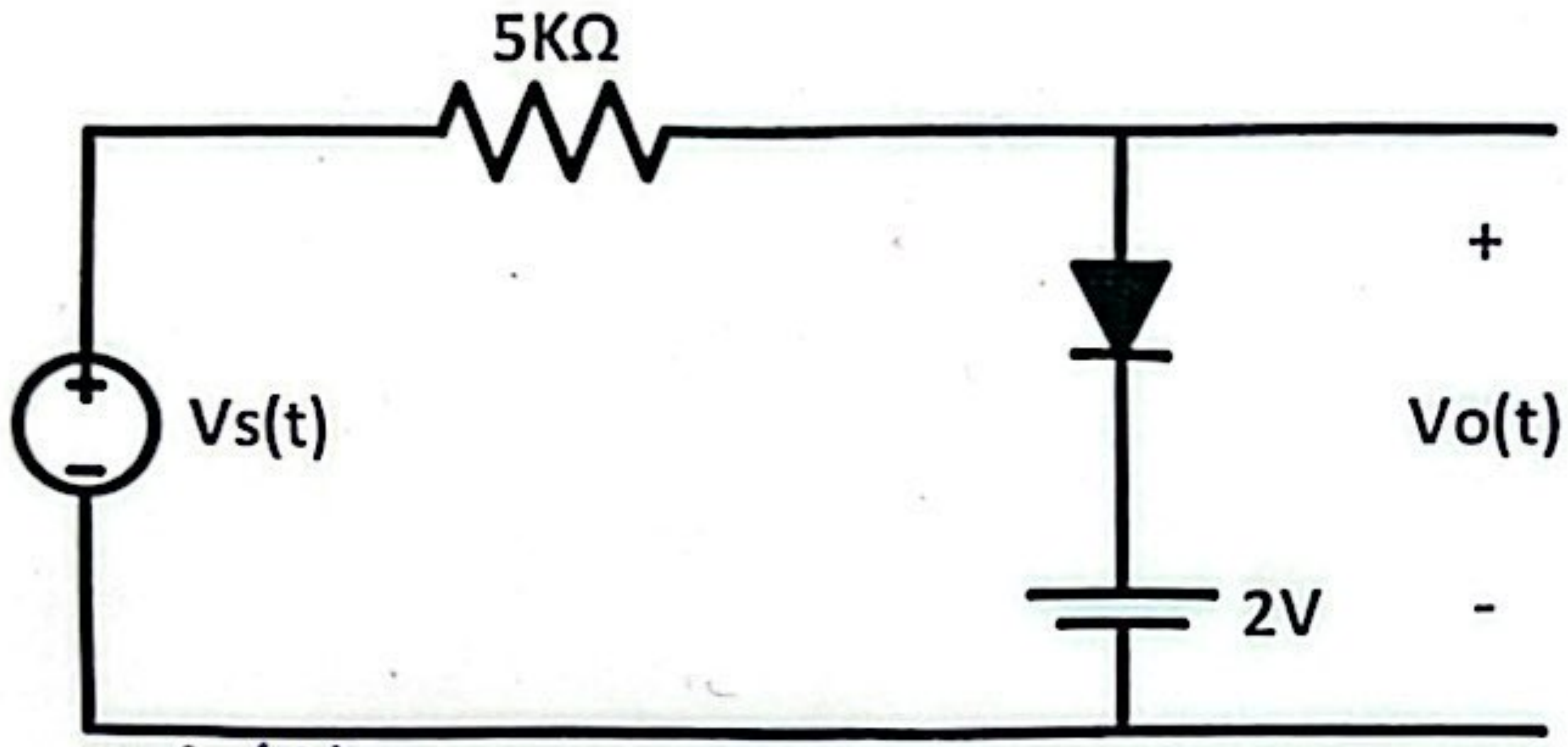
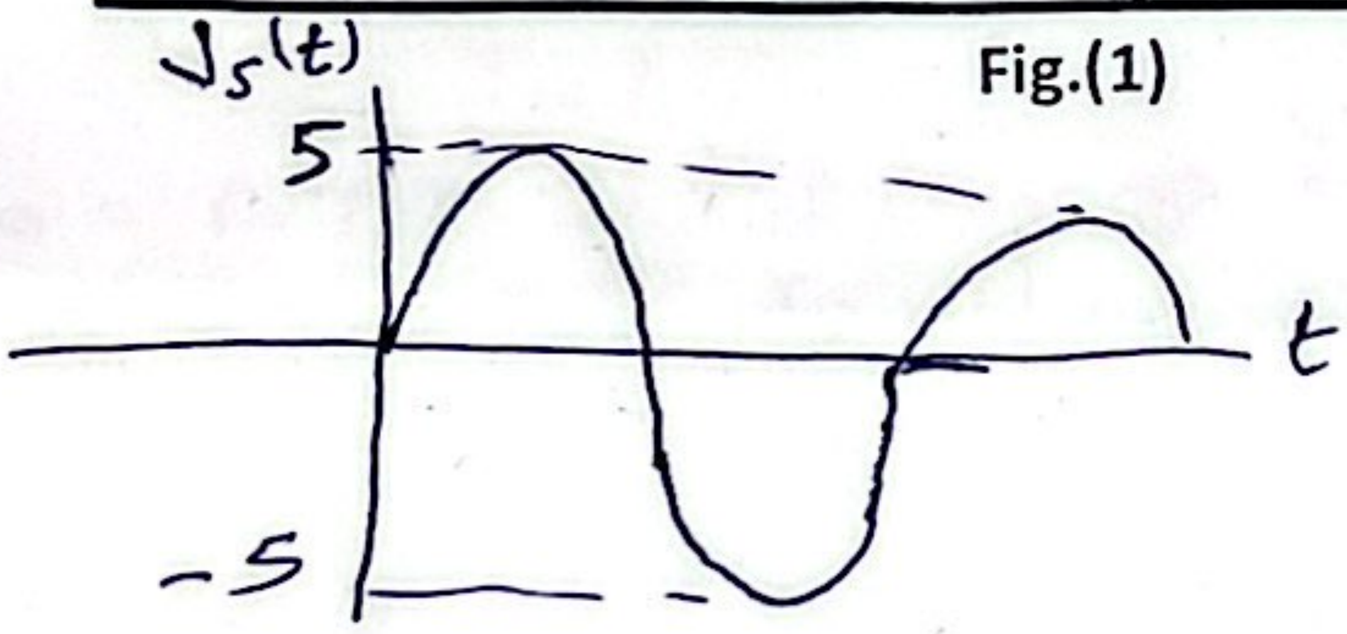
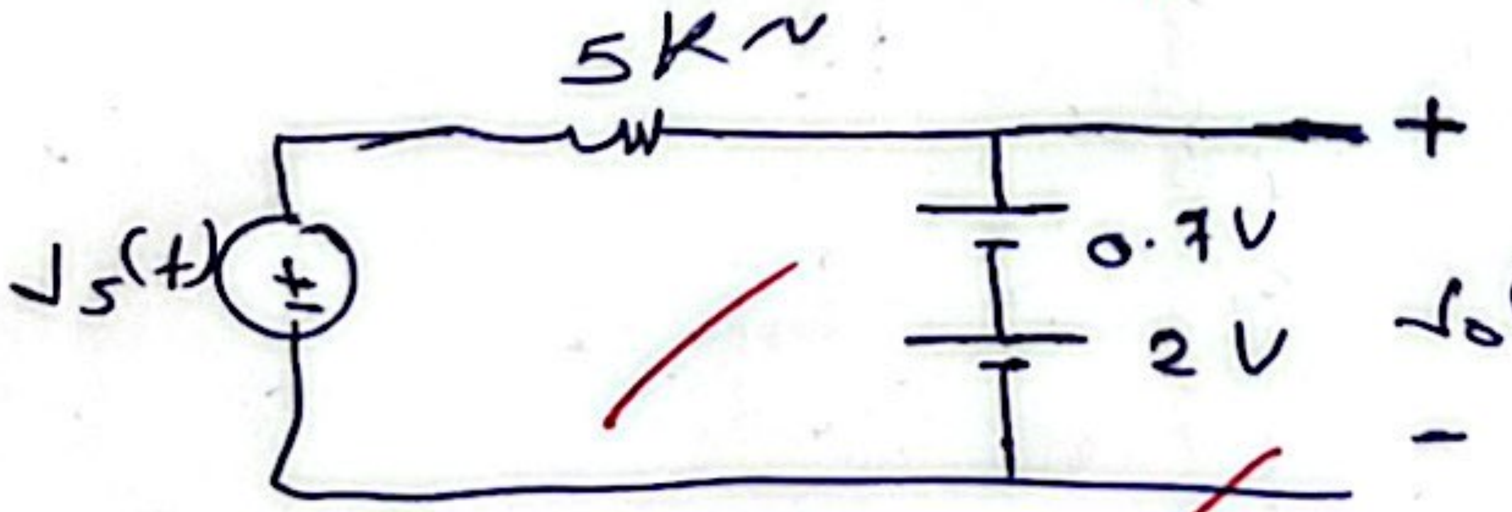


Fig.(1)



① assume the Diode is on (V_K)



$V_D = 0.7$ Volt

$i_D = \frac{V_s(t) - 0.7 - 2}{5K} > 0$

$= \frac{V_s(t) - 2.7}{5K} > 0$

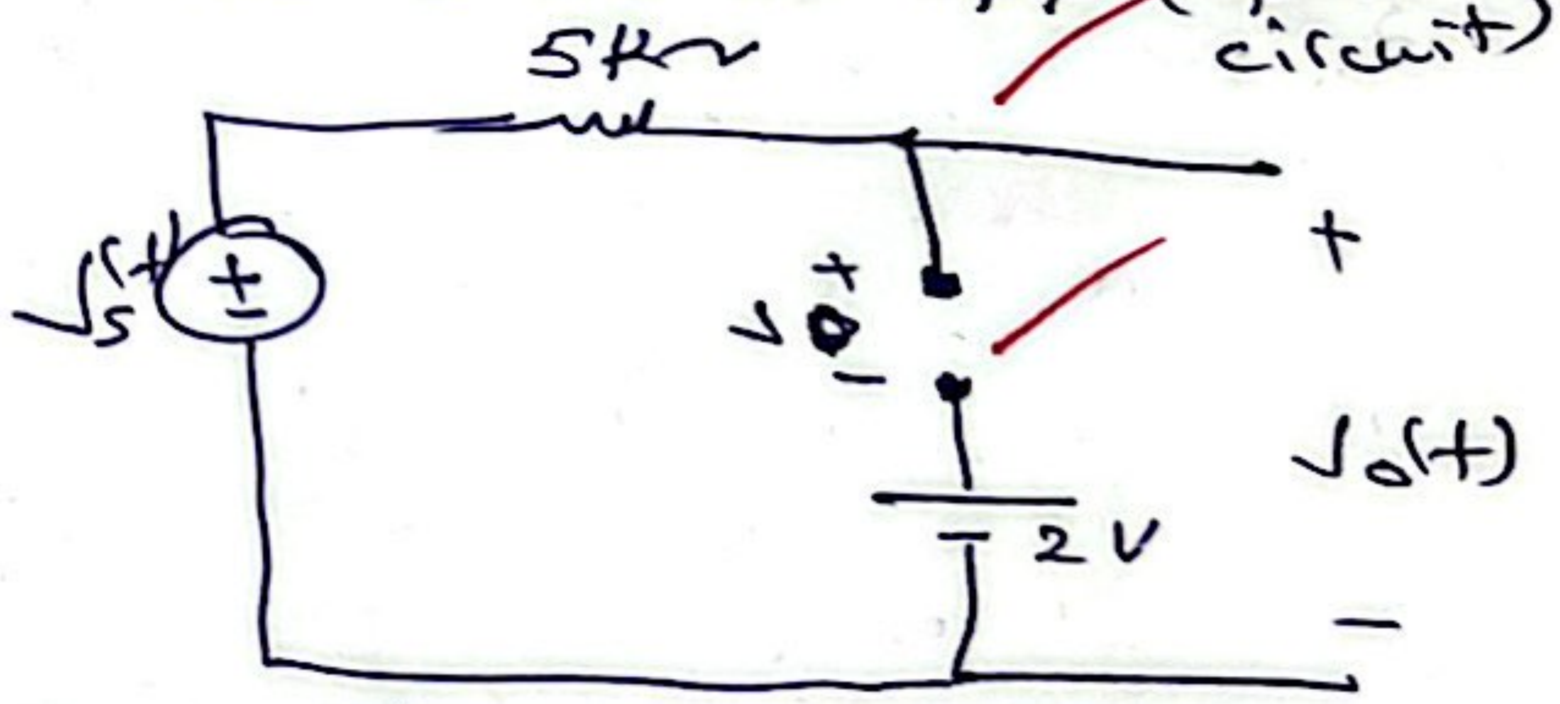
$V_s(t) > 2.7$ Volt

∴ When $V_s(t) > 2.7$ Volt the Diode is on

$V_D = 0.7$ Volt.

$V_o(t) = 0.7 + 2$
$= 2.7$ Volt.

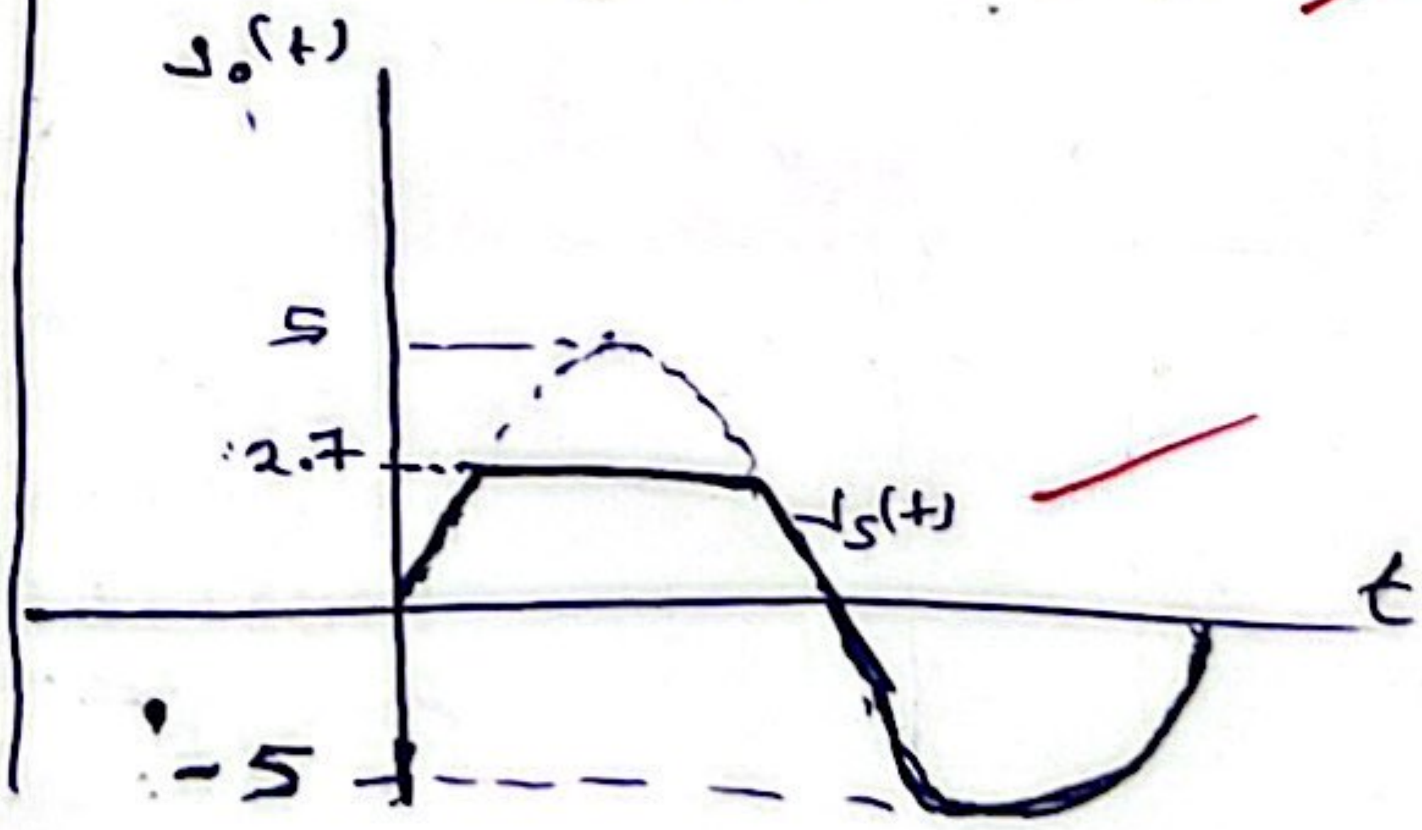
② When $V_s(t) < 2.7$ Volt the Diode is off (open circuit)



$-V_s(t) + V_D + 2 = 0$

$V_D = V_s(t) - 2$ Volt.

$V_o(t) = V_D + 2$
$= V_s(t) - 2 + 2$
$= V_s(t)$ Volt.



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Quiz2 **25/7/2024**

Instructor: Mr.Mohammad Al - Jubeh

Student Name: Mohammed Jamil Saada

Student ID: 1221972

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Calculate and plot Vo(t) for the circuit shown in Fig.(1-a) for the input voltage shown in Fig. (1-b). Assume the diode is ideal.

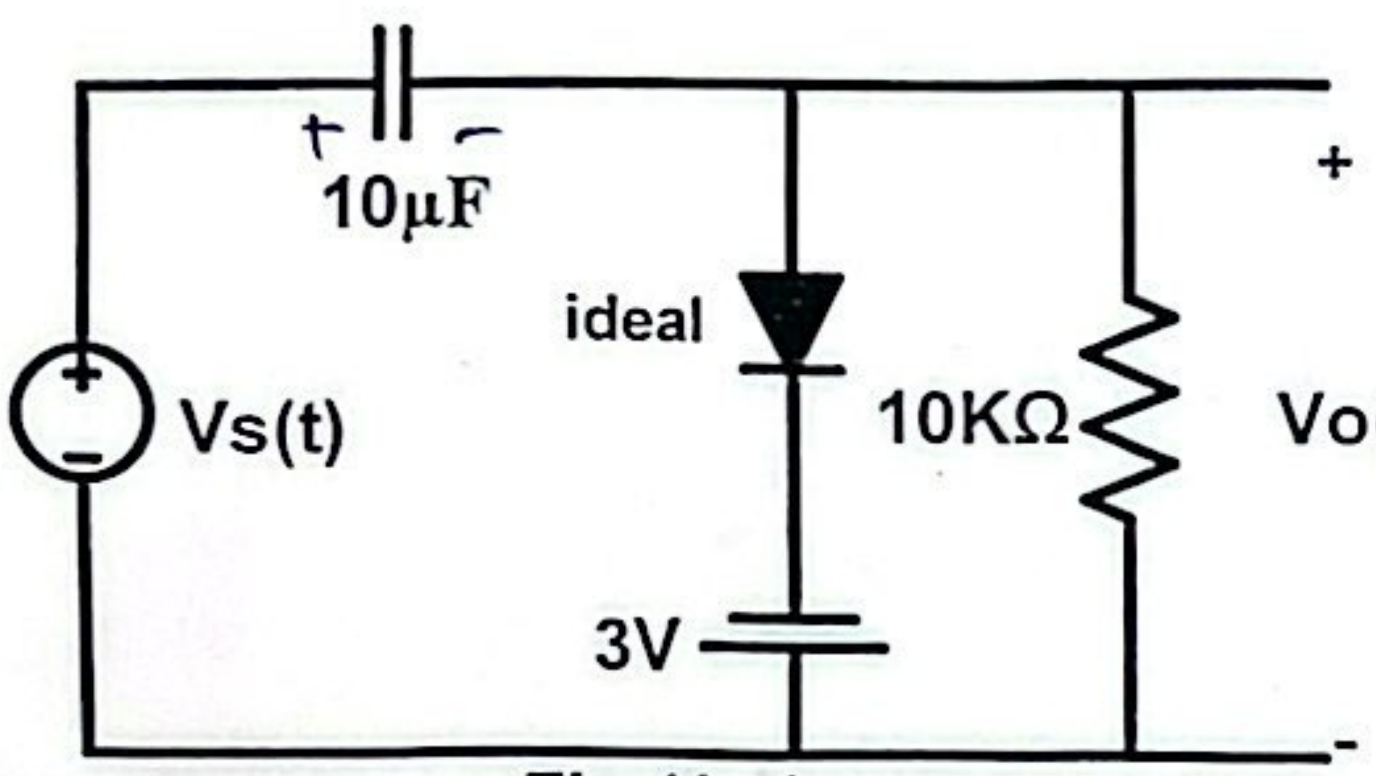


Fig.(1-a)

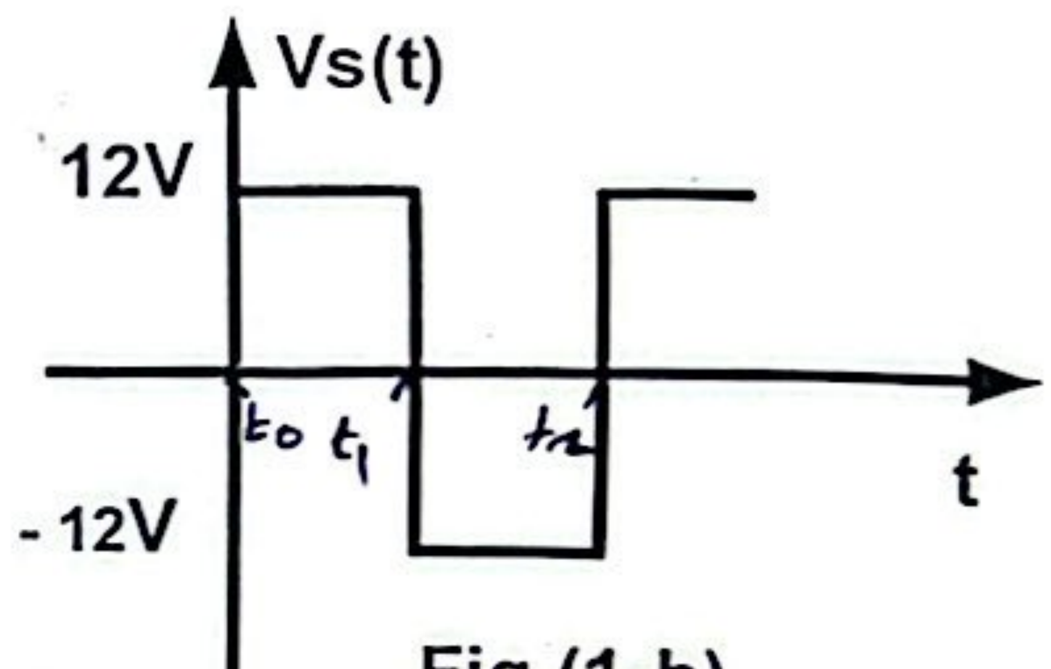


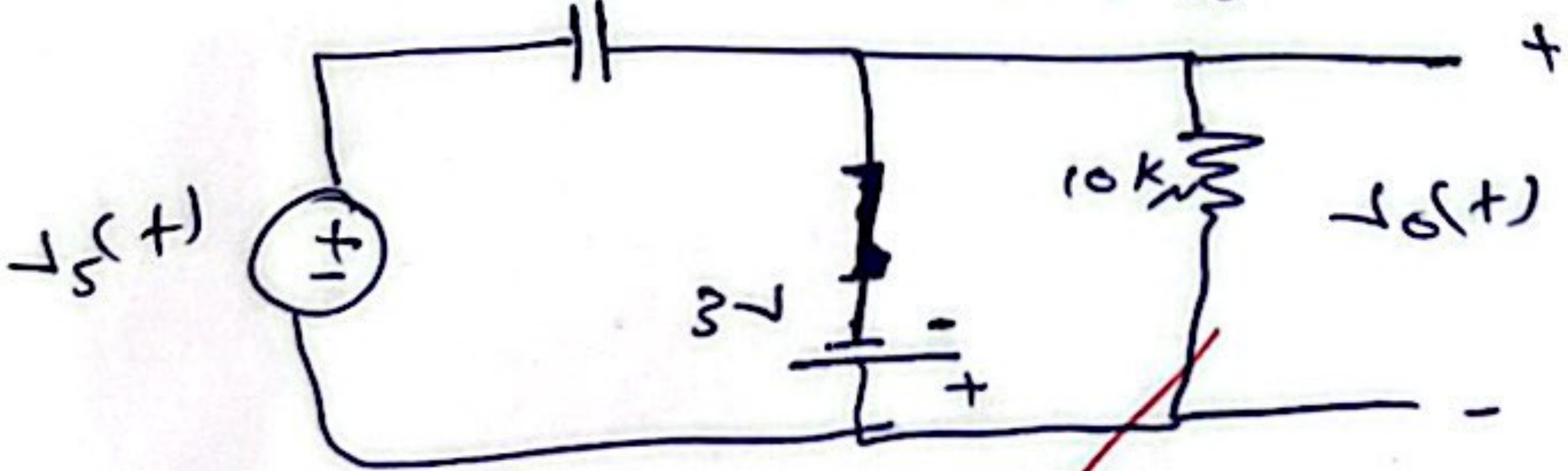
Fig.(1-b)

clamppi[ng] circuit

$V_c(0^-) = V_c(0^+) = 0$ Volt.

$V_s(0^+) = 12$ Volt.

When $V_s(0^+) > 0$ (12) the Diode is on for $t_0 < t < t_1$ (short circuit)

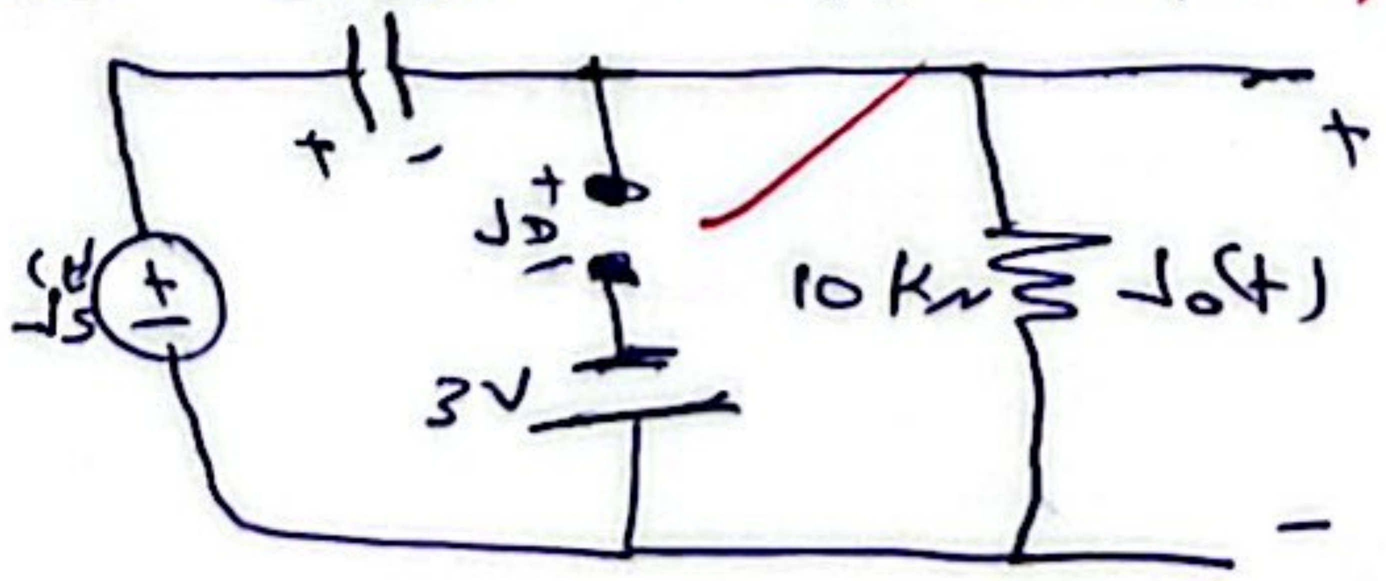


$V_o(t) = -3$ Volt.

$-V_s(t) + V_c - 3 = 0$

$V_c = 15$ Volt.

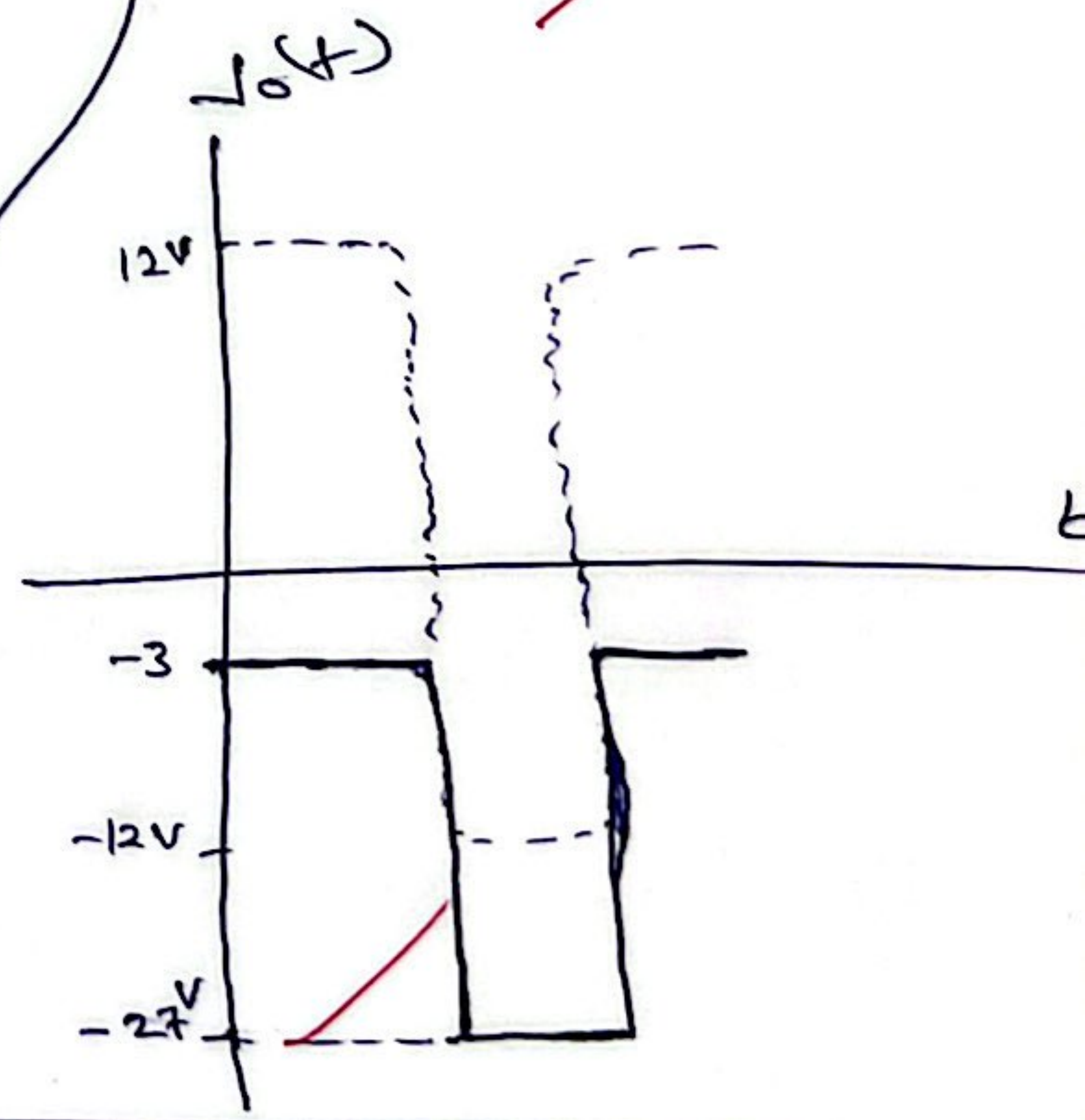
When $t_1 < t < t_2$ $V_s(t) < 0 = -12$ volt the Diode is off → open circuit



$-V_s(t) + V_c + V_o(t) = 0$

$12 + 15 + V_o(t) = 0$

$V_o(t) = -27$ Volt.



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Quiz3 **8/8/2024**

Instructor: Mr.Mohammad Al - Jubeh

Student Name: Mohammed Jamil Saada محمد جميل سعدة

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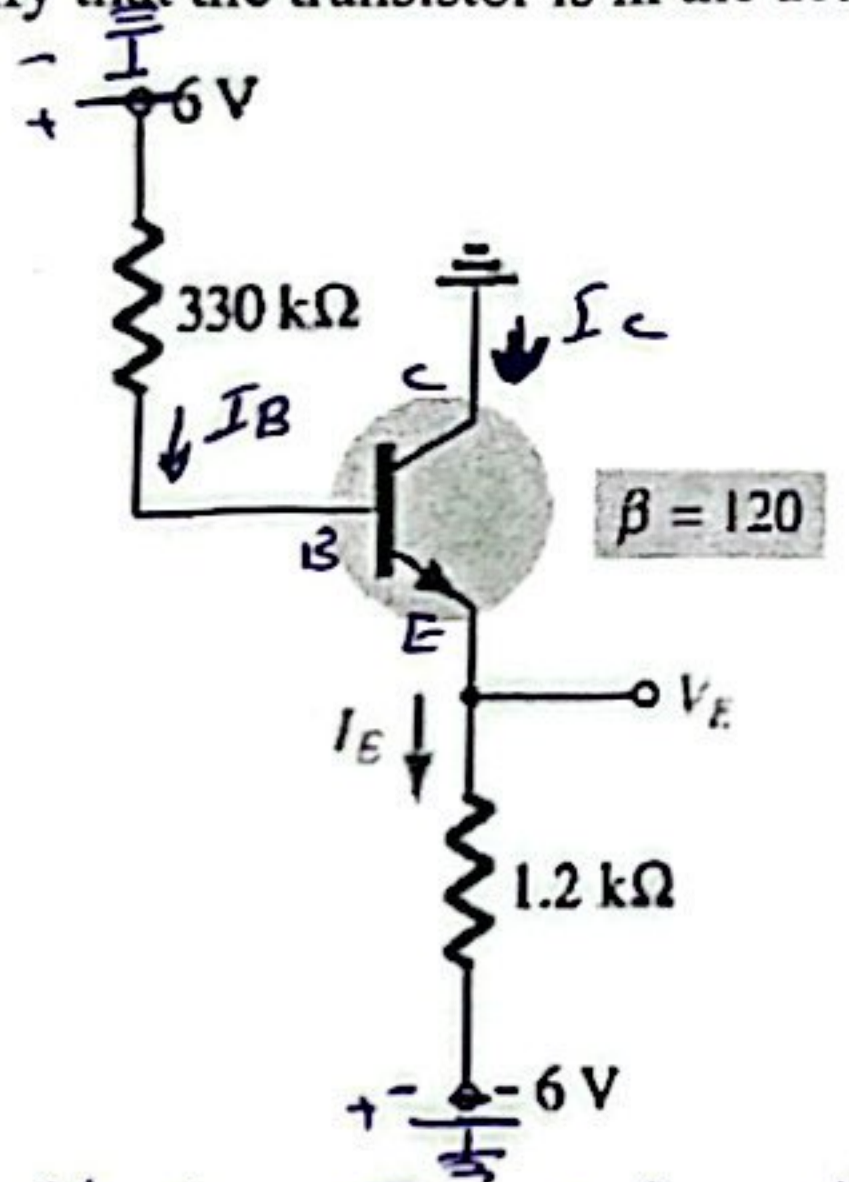
10/10

The BJT in the circuit shown has β = 120

a) Calculate ICQ
b) Calculate VE
c) Calculate VB
d) Verify that the transistor is in the active region



assume that Transistor is in active region.

$6 = I_B(330k) + V_{BE} + I_E(1.2k) - 6$ But $I_E = (\beta+1) I_B = 121 I_B$

$12 = (330k) I_B + 0.7 + (1.2k)(121 I_B)$

$11.3 = (330k) I_B + (145.2k) I_B$

$11.3 = 475.2k\, I_B \rightarrow \boxed{I_B = 0.0238\ mA}$

(a) $I_{CQ} = \beta I_B = (120)(0.0238) \Rightarrow \boxed{I_{CQ} = 2.85\ mA}$

$I_E = (\beta+1) I_B$

(b) $I_E = 121 I_B = 2.877\ mA$

$V_E = I_E(1.2k) - 6$

$= (2.877)(1.2) - 6 = \boxed{-2.547\ Volt}\ V_E$

(c) $V_{BE} = 0.7 = V_B - V_E \Rightarrow V_B = 0.7 + V_E$

$\boxed{V_B = -1.847\ Volt}$

(D) Verify that Transistor is in active region.

KVL:

$V_{CE} + (1.2k) I_E - 6 = 0$

$V_{CE} = 6 - (1.2k) I_E$

$V_{CE} = 6 - (1.2)(2.877)$

$= 6 - 3.4524$

$= 2.5476\ Volt$

since $V_{CE} = 2.54 > V_{CE,sat} = 0.2$

then, the assumbtion is correct and the transistor is in active region

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Quiz4 22/8/2024

Instructor: Mr.Mohammad Al - Jubeh

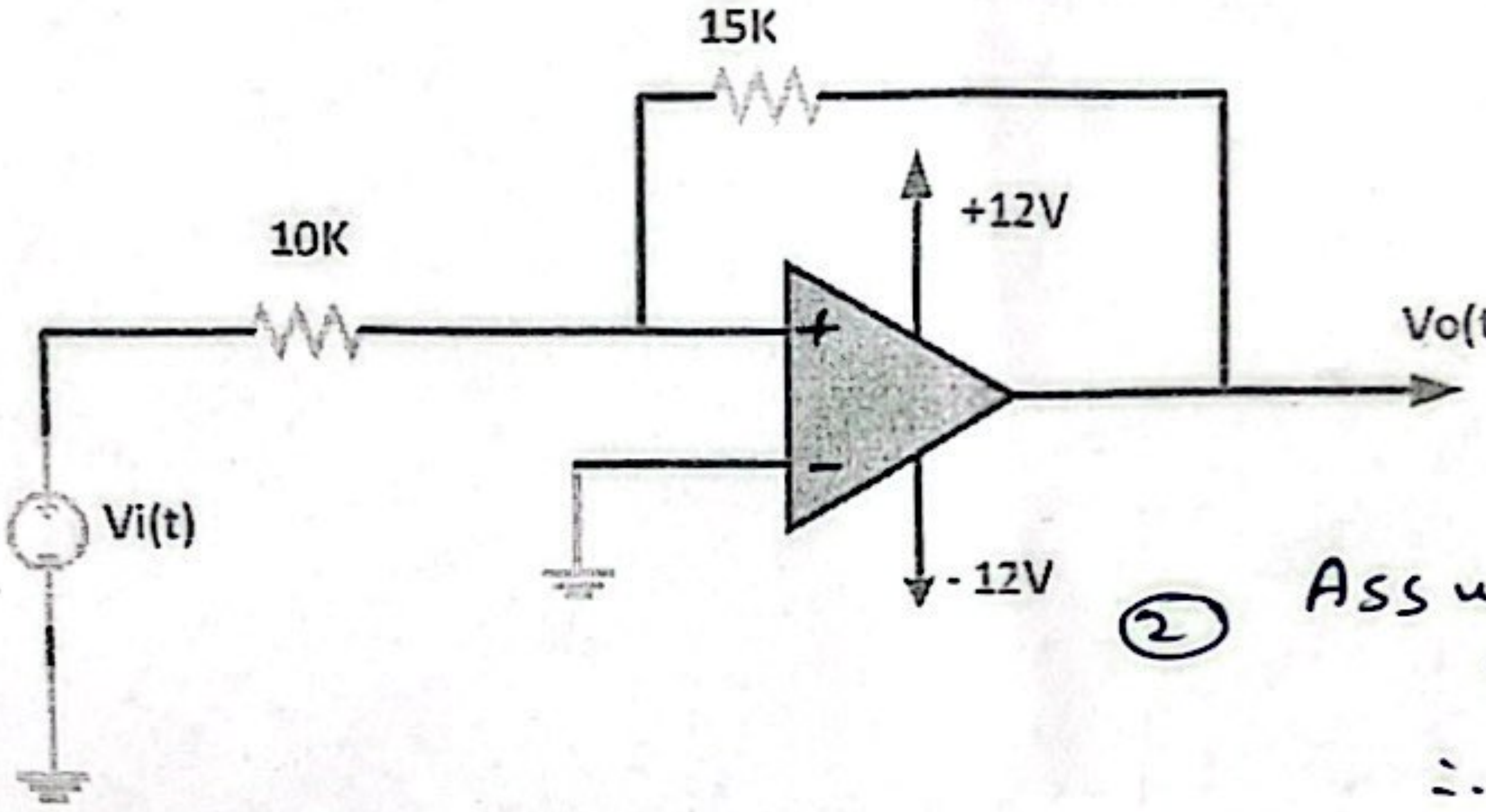
Student Name: ....

Student ID: ....

For the circuit shown

a) Calculate the lower and upper threshold voltages

b) Based on results in (a) sketch Vo(t) as a function of Vs(t) (Hysteresis)



① Assume $V_o = +V_{sat}$

$V_d > 0$

$V(+) - V(-) > 0$

$V(+) > V(-)$

~~since~~ $V(-) = 0$

$\therefore V(+) > 0$

By supperposition.

$V(+) = \frac{10K}{10K+15K}(+V_{sat}) + \frac{15K}{10K+15K} V_i$

$V(+) = 4 + 0.6 V_i > 0$

$0.6 V_i > -4$

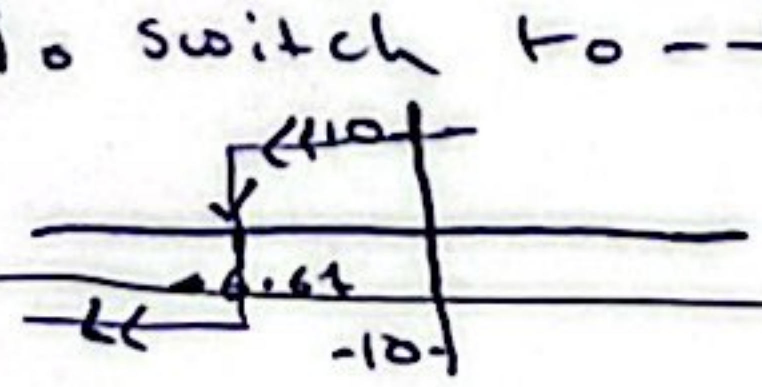
$V_i > -6.67$

when $V_i > -6.67$ Volt

$V_o = +V_{sat}$

when $V_i < -6.67$ Volt.

V_o switch to $-V_{sat}$



② Assume $V_o = -V_{sat}$

$V_d < 0$

$\therefore V(+) < 0$

$V(+) = \frac{10K}{10K+15K}(-V_{sat}) + \frac{15K}{10K+15K} V_i$

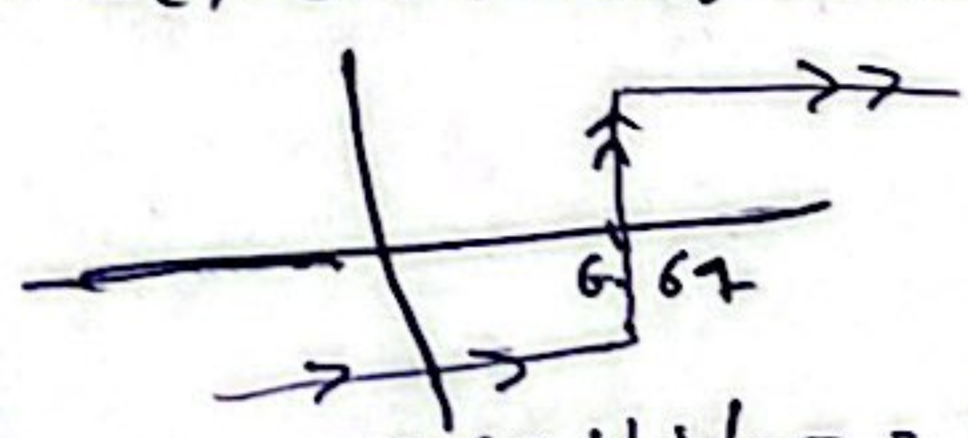
$V(+) = -4 + 0.6 V_i < 0$

$0.6 V_i < 4$

~~0~~ $V_i < 6.67$ Volt.

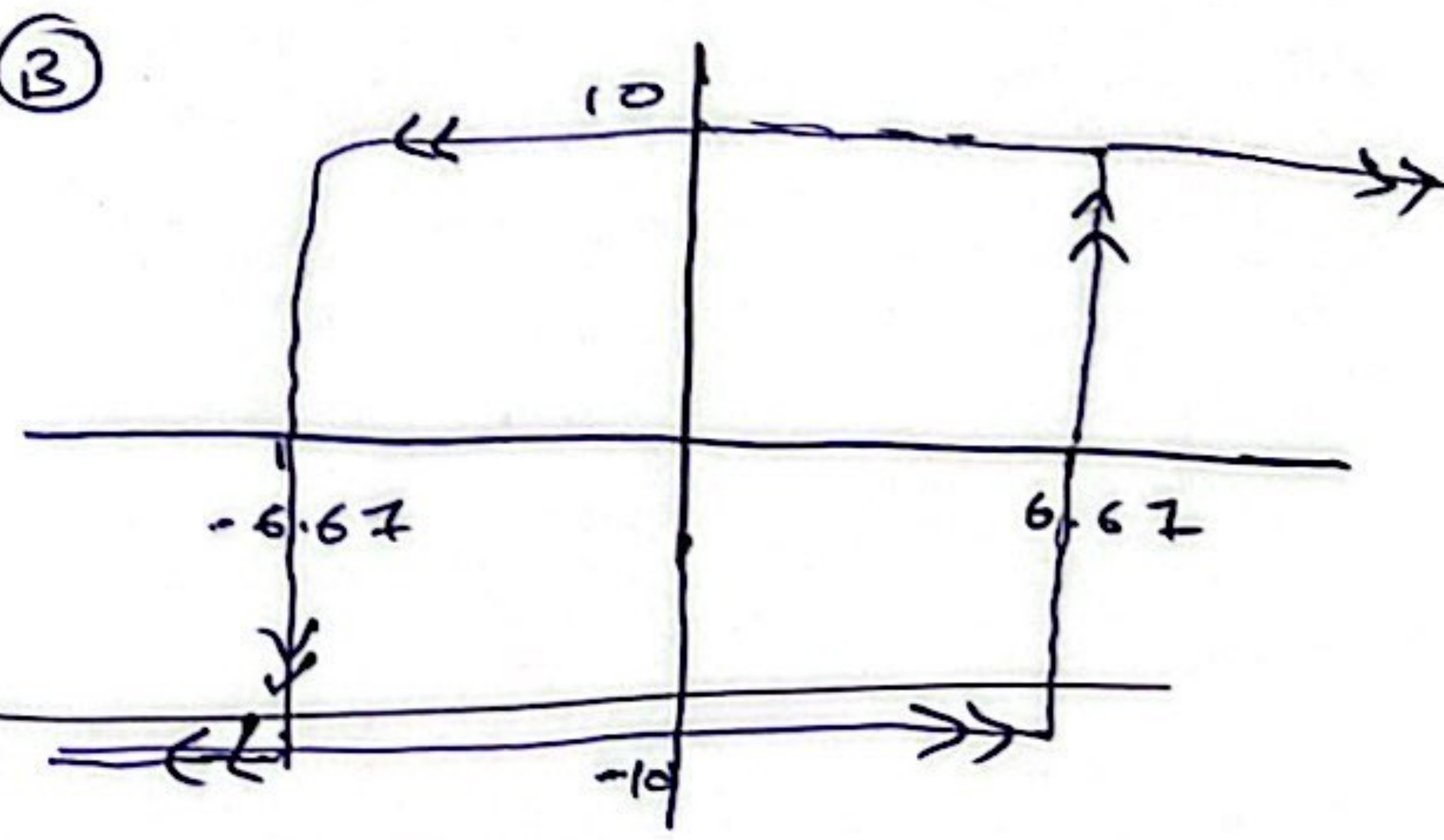
when $V_i < 6.67$ Volt $\rightarrow V_o = -V_{sat}$

when $V_i > 6.67 \rightarrow V_o$ switch to $+V_{sat}$



$V_{LT} = -6.67$ V, $V_{UT} = 6.67$ V

③



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Quiz5 **22/8/2024**

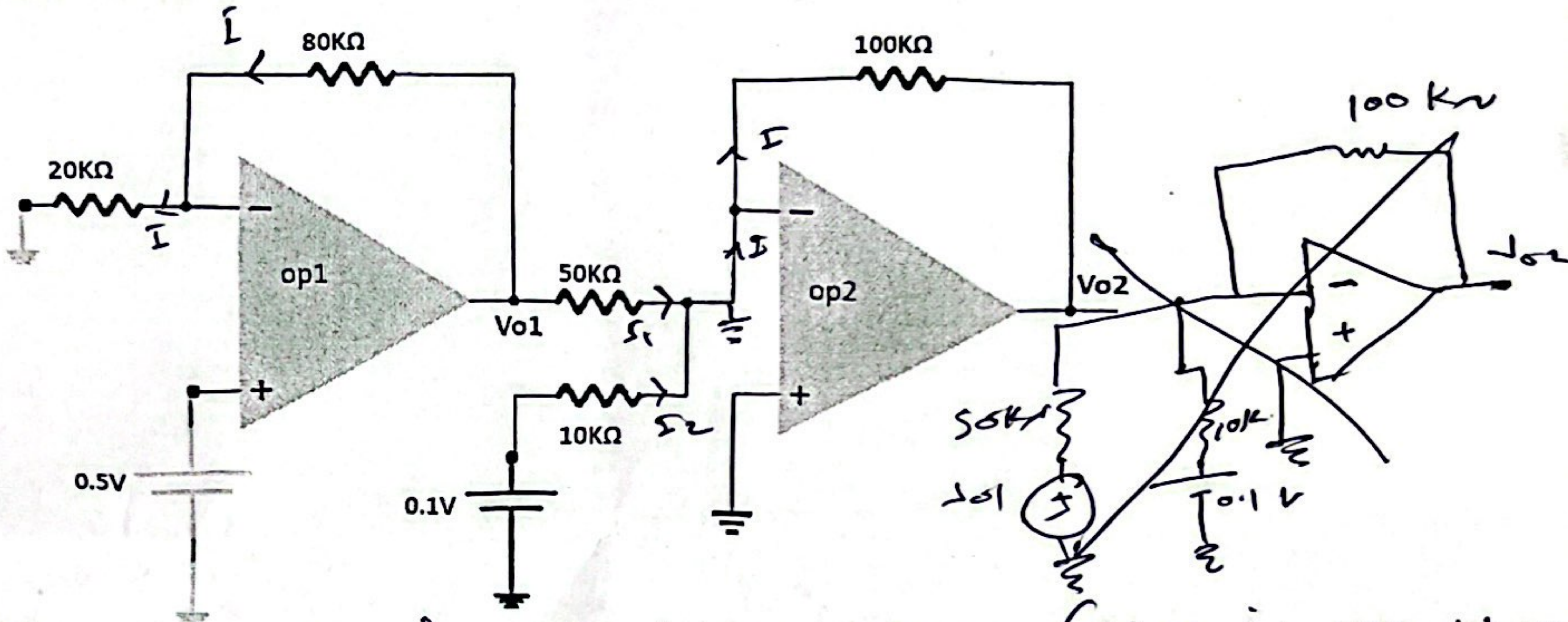
Instructor: Mr.Mohammad Al - Jubeh

Student Name: ....

Student ID: ....

The op.amps in the circuit shown ae ideal

a) Calculate Vo1
b) CalculateVo2



op1 and op2 in the linear region (there is negative feed back)

for op1

$V_d = 0$ (Linear region)

$V(+) = V(-)$

$V(+) = 0.5$ Volt.

$\therefore V(-) = 0.5$ Volt.

$I = \frac{0.5}{20k} = 0.025$ mA

$V_{o1} = I(80k + 20k)$

$= (0.025m)(100k)$

$= 2.5$ Volt

for op2

$V_d = 0$ (Linear region)

$V(+) = V(-)$

$V(+) = 0$

$\therefore V(-) = 0$

$I_1 = \frac{V_{o1}}{50k} = \frac{2.5}{50k} = 0.05$ mA

$I_2 = \frac{0.1}{10k} = 0.01$ mA

$I = I_1 + I_2 = 0.06$ mA

$V_{o2} = (-I)(100k\Omega)$

$= (-0.06)(100)$

$= -6$ Volt.

Name: ID: