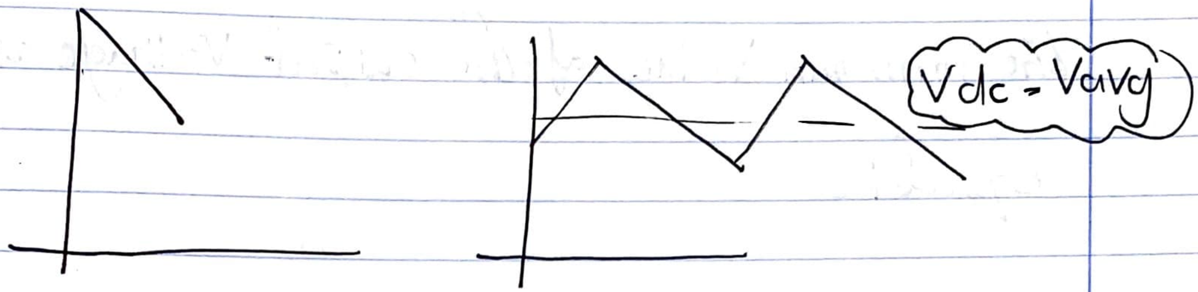
Huda AbuZayed

First Exam

بعرف انه الكل هلأ رح يبلش يدرس الفورمات على أمل انه بس ينجح بالمادة من كتر
ما سمع من الطلاب عن انها مادة صعبة ومعقدة وصعب ينجاب فيها علامات
بس هابة أحكيلكم انه صح المادة يمكن مش سهلة ولكن عادي ينجاب فيها علامات
اذا أعطيتوها الجهد المطلوب ودرستوا منيح [illegible] ⬅️💜😁😃🥰🌚❤️🙅🏼‍♀️
وبنصحكم بقناة على اليوتيوب اسمها " Circuit-q9 " اذا تصيروا تحضروا المادة
المطلوبة منكم بالامتحان منها وبعدها تروحوا للسلايدات رح تحسوا حالكم فاهمين
المادة وانه الأمور تبسطت أكتر من شرح الدكتور..
وبالتوفيق بالامتحان

For a diode rectifier with filter, the output waveform has an average value = 20V as shown & a ripple factor 5%, the minimum value of the output voltage is equal



$V_{avg} = 20V$

$r = 5\%$

$V_{\ell r, p-p} = V_{max} - V_{min}$

$$r = \frac{\frac{V_{\ell r, p-p}}{2\sqrt{3}}}{V_{avg}}$$

$$\frac{5}{100} = \frac{\frac{V_{\ell p-p}}{2\sqrt{3}}}{20}$$

$$1 = \frac{V_{\ell p-p}}{2\sqrt{3}}$$

$2\sqrt{3} = V_{\ell p-p}$

$V_{avg} = V_m - \frac{1}{2} V_{p-p}$

$20 = V_m - \frac{1}{\cancel{2}} \times \cancel{2}\sqrt{3} = 20 + \sqrt{3} = V_m$

$V_{\ell p-p} = V_m - V_{min}$

$2\sqrt{3} = 20 + \sqrt{3} - V_{min}$

$V_{min} = 18.27$

قانون تاني

$V_{min} = V_m - \frac{2V_m}{\pi} *$ ripple factor

$V_{min} = V_m - V_r$

$V_{avg} = V_m - \frac{V_r}{2}$

$V_m = 20\sqrt{2}$

$V_{min} = 20 - \frac{2 \times 20 \times \sqrt{2}}{\pi} \times \frac{5}{100}$

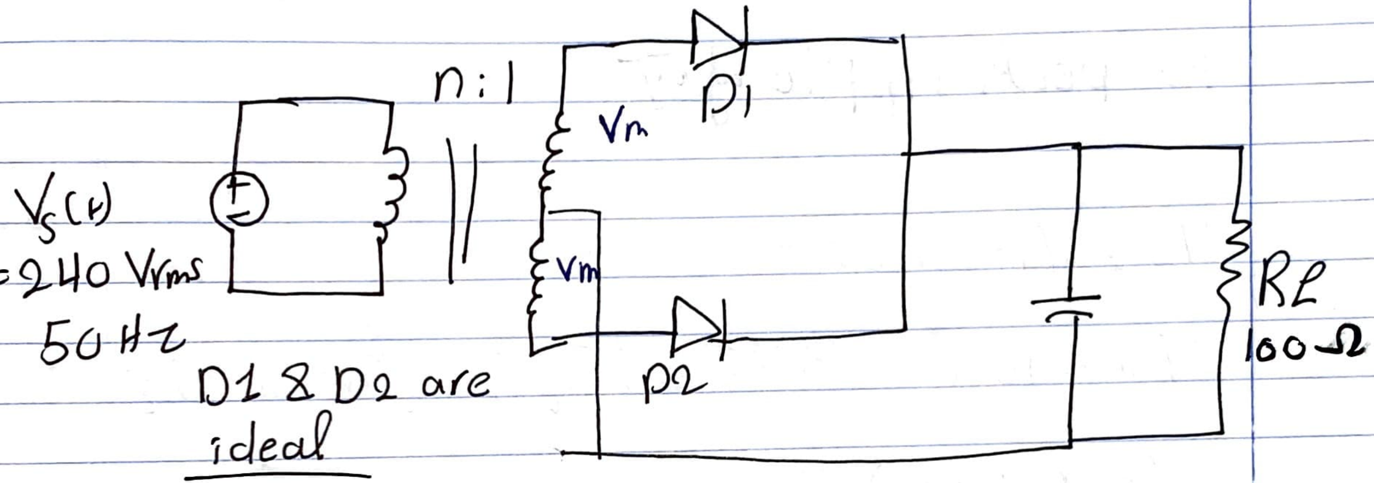
For a diode rectifier with filter the output wave form has an average value = 20V as shown & ripple factor = 2%

the minimum value of the output voltage is equal to

The circuit shown is to be designed so that $V_{L,dc} = 12V$ & $V_{Lr\,p-p} = 2V$.

1) The requieered capacitor C is equal to

2) the required turns ratio n is equal to



D1 & D2 are ideal

$V_L\,dc = 12$, $V_{L,r,p-p} = 2V$

$V_L\,dc = V_m - \frac{1}{2} V_{rL\,p-p}$.

$12 = V_m - \frac{1}{2} \times 2$ $\boxed{V_m = 13\,V}$

$V_m = \sqrt{2}\, V_{m(rms)}$

$V_{rms} = \frac{V_m}{\sqrt{2}}$

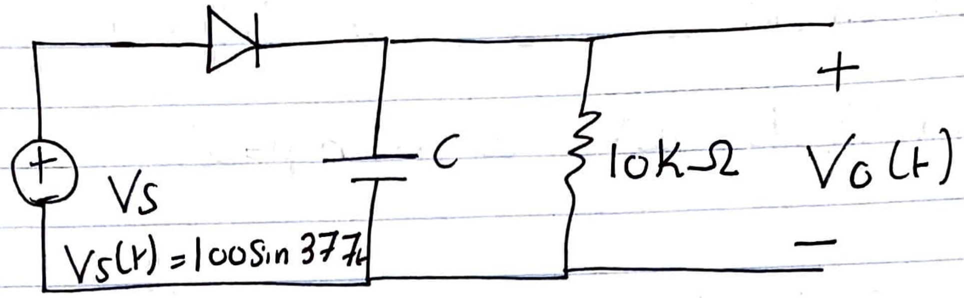
$V_L = \frac{V_m}{2 f_o R C} = \frac{13}{2 \times 50 \times 100 \times C}$

$C = 0.65\,mF$

$n = \frac{V_s(rms)}{V_m(rms)} = \frac{240}{\frac{13}{\sqrt{2}}}$

$V_m = \frac{N_S}{N_P} \cdot V_{mp}$

$13 = \frac{1}{n} \frac{240}{\sqrt{2}}$ $n = 26.1$



For the circuit shown, the value of the capacitor C that will results in a peak to peak ripple of 2V

$V_S = V_m \sin \omega t$

$V_m = 100 \qquad 377 = 2\pi f_o \qquad f_o = 60\, Hz$

$$V_{r-p-p} = \frac{V_m}{f_o R C}$$

$$2 = \frac{100}{60 \times C \times 10}$$

$C = 83.3\, \mu f$

Full wave Center-tapped rectifier has
$V_A(t) = 10 \sin \omega t$ V & 4.7k Load resistanc
what is the dc Load current for the
circuit Vdc

Assume $V_K = 0.7$

$V_A = 10 \sin \omega t$ V
$R = 4.7\ K\Omega$
$I_{dc} = ??$
$V_K = 0.7$ V

for full wave Rectifier

$V_{dc} = 0.63\ V_m$

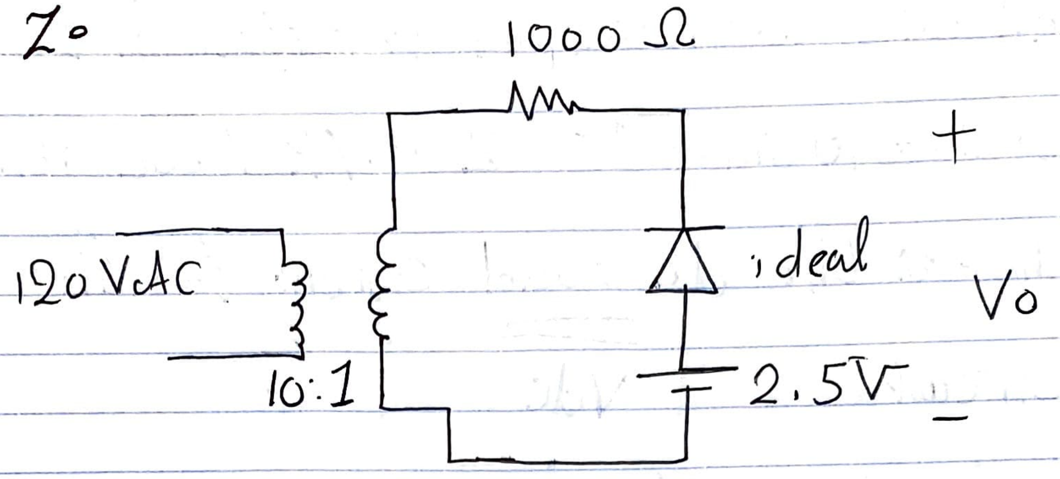
$V_m = 10 - 0.7 = 9.3$

V_{dc} Load $= 5.9148$

Load Current $= \dfrac{5.9148}{4.7} = 1.258$ mA

$\frac{V_{dc}}{R_L}$

2.

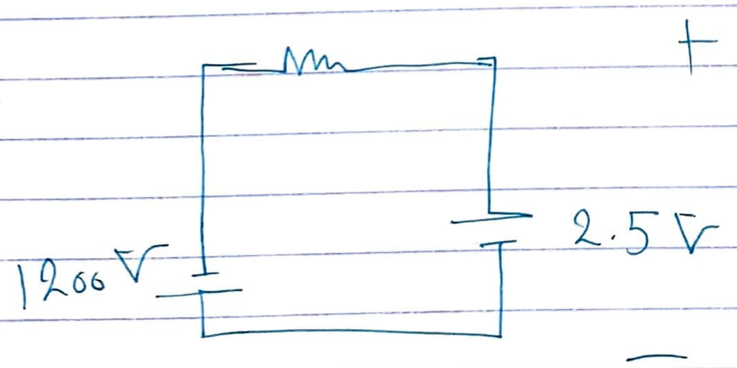


For the clipping circuit, what will be the maximum output Voltage when the diode is conducting

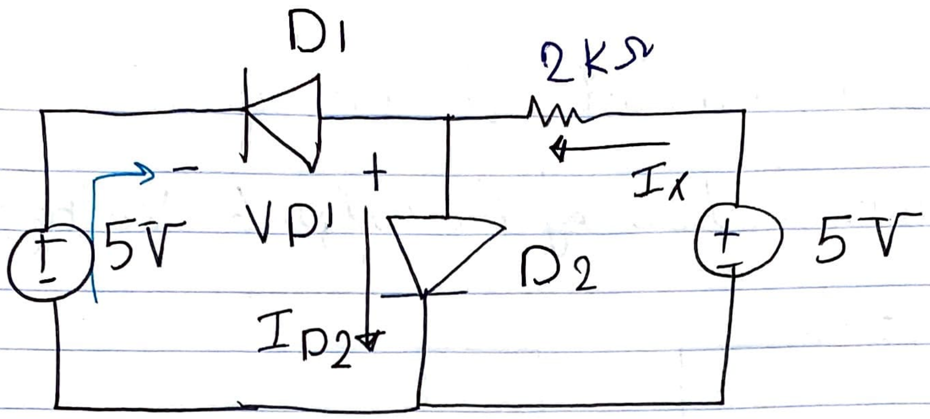
Conducting → The diode is ON

$\frac{Vs}{Vin} = \frac{10}{1}$

$Vs = 10 \times 120 = 1200 V$



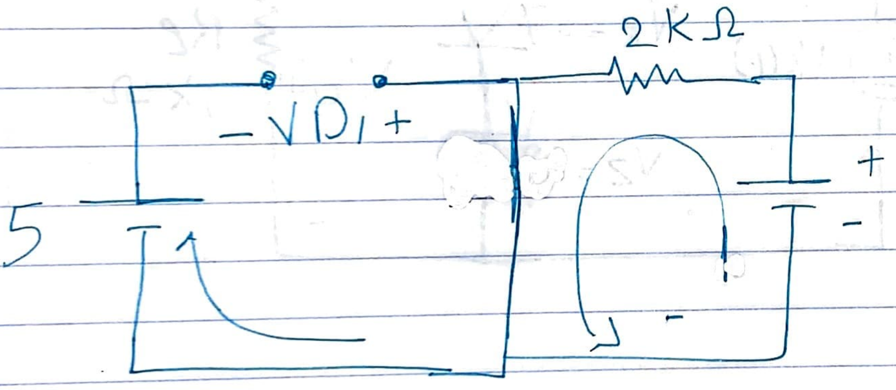
$\boxed{Vo = 2.5V}$



$I_x =$

$V_{D1} = ??$

D_1 is off & D_2 is ON
D_1 is O.C D_2 is S.C

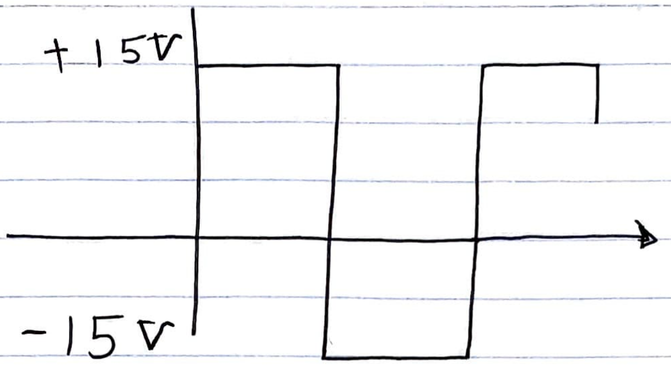


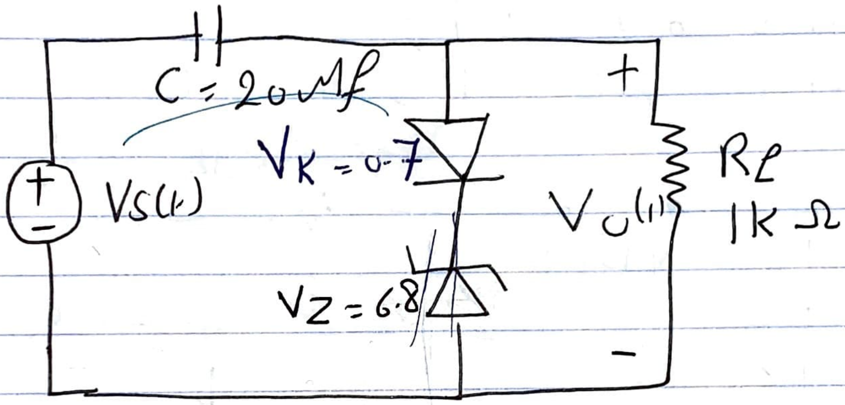
$-5 + 2I_x = 0 \quad I_x = 2.5\,mA$

$-5 - V_{D1} = 0 \quad V_{D1} = -5V$

ولما تكون المقاومة = 3KΩ تكون ال $I_x = 1.66$

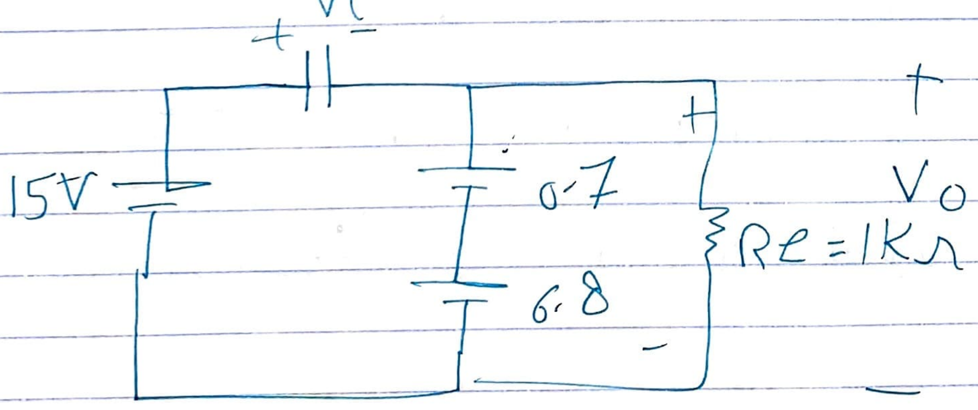
For the circuit shown, what is the minimum value of the output voltage $V_o(t)$





+ve

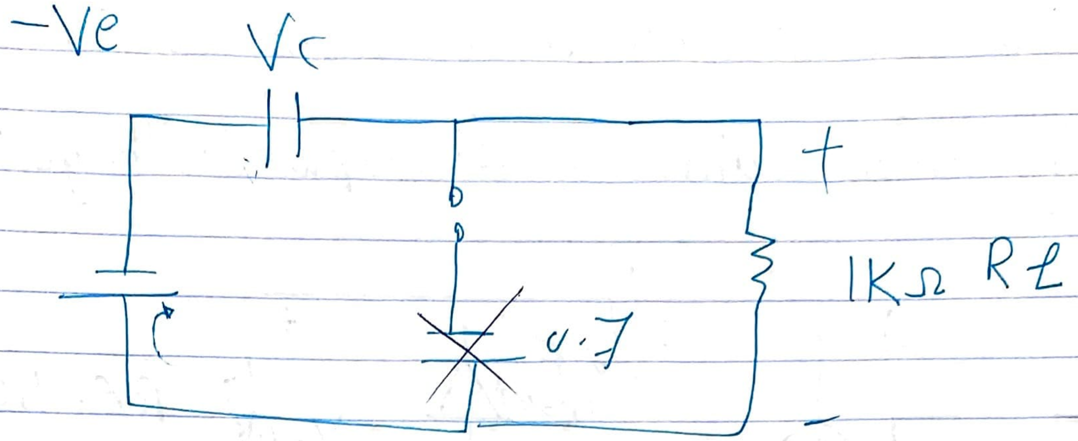
$V_S = 15V$ D_1 is ON V_Z in Break down



$V_{o\,max} = 7.5$

$-15 + V_C + 7.5 = 0$

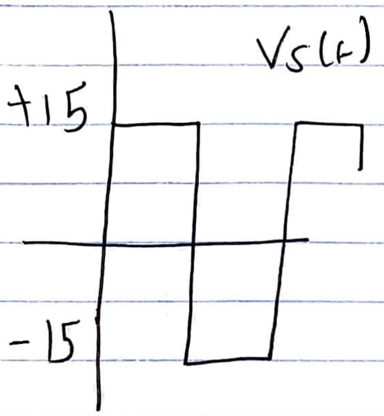
$V_C = 7.5\,V$

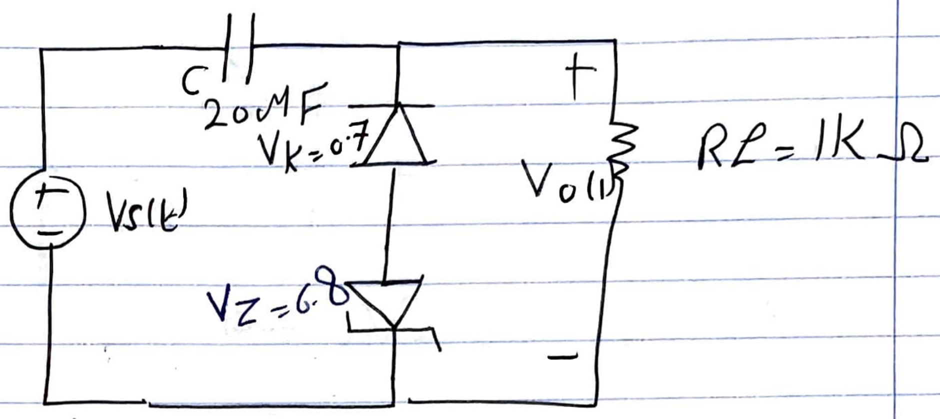


$+15 + 7.5 + V_o = 0$

$V_o = --22.5$

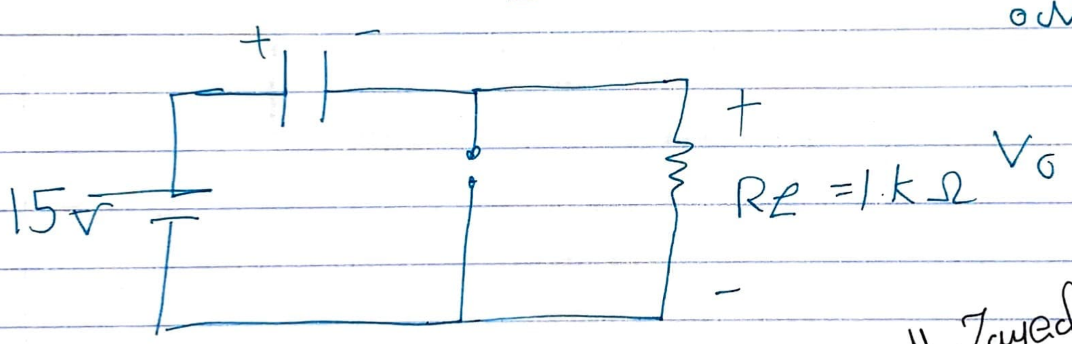
For the circuit shown, what is the maximum value of the output Voltage $V_o(t)$





when $V_s = 15\,V$

D_1 is off o.c & Zener is Diode ON S.C



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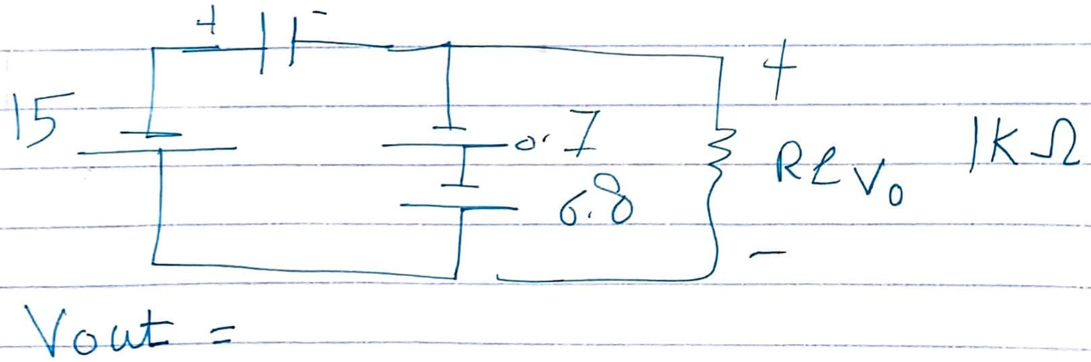
$V_o - V_C + 15 = 0$

$V_o = 15 - V_C$

when $V_s = -15\,V$



Vout =

$-V_o - 0.7 - 6.8 = 0$

$V_o = -7.5$

$15 + V_C - 0.7 - 6.8 = 0$

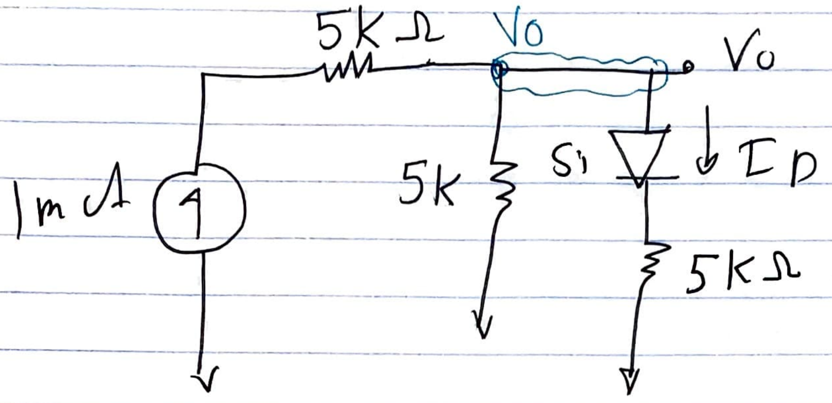
$15 + V_C - 7.5 = 0$

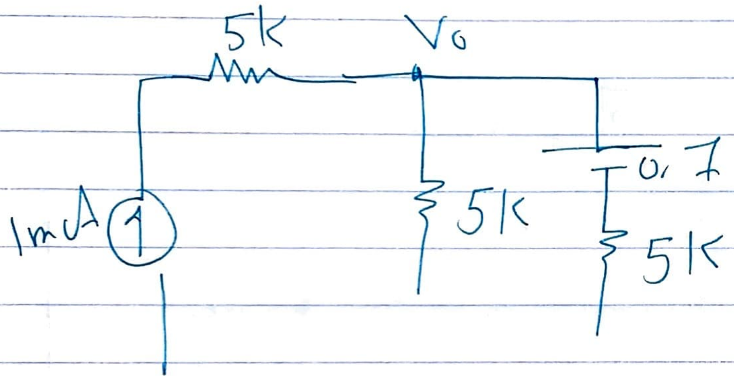
$V_C + 7.5 = 0$

$V_C = -7.5$

$V_o = 15 + 7.5 = 22.5$

For the circuit shown, using the knee Voltage model find Vo

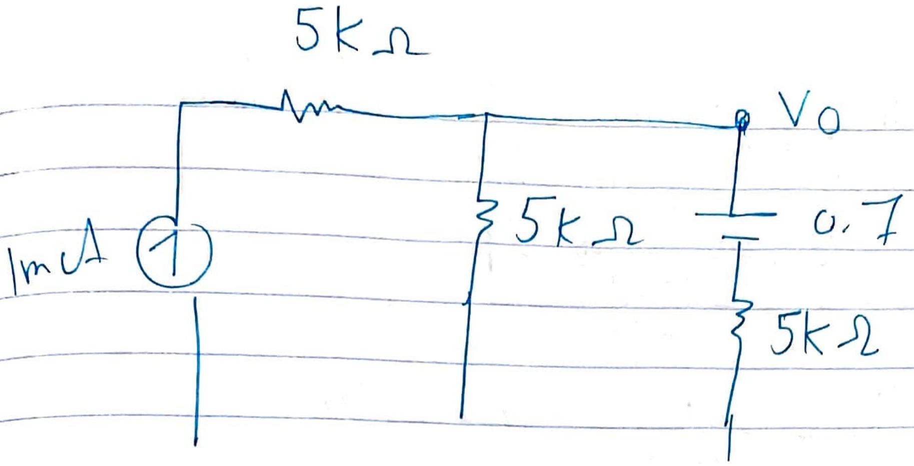




$$\frac{V_o}{5} + \frac{V_o - 0.7}{5} = 1$$

$$2V_o = 5.7 \quad V_o = 2.85\,V$$

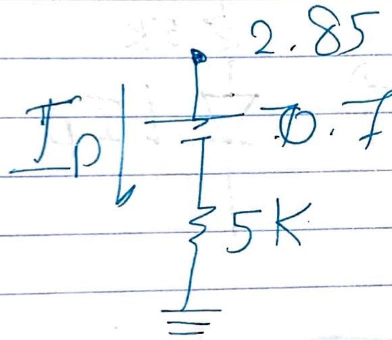
$$1 = V_o\left(\frac{1}{5} + \frac{1}{5}\right) - \frac{0.7}{5}$$



Apply KcL

$$-1mA + \frac{V_o}{5K} + \frac{V_o - 0.7}{5K}$$

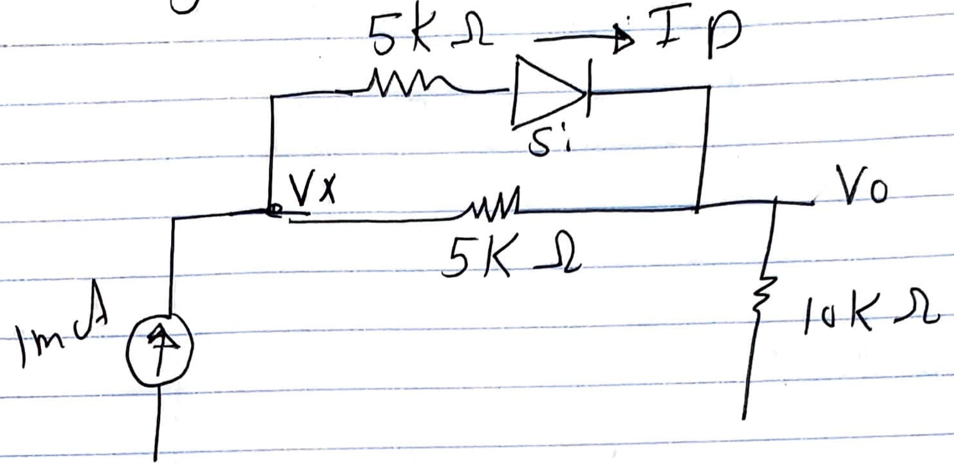
$$V_o = 2.85$$

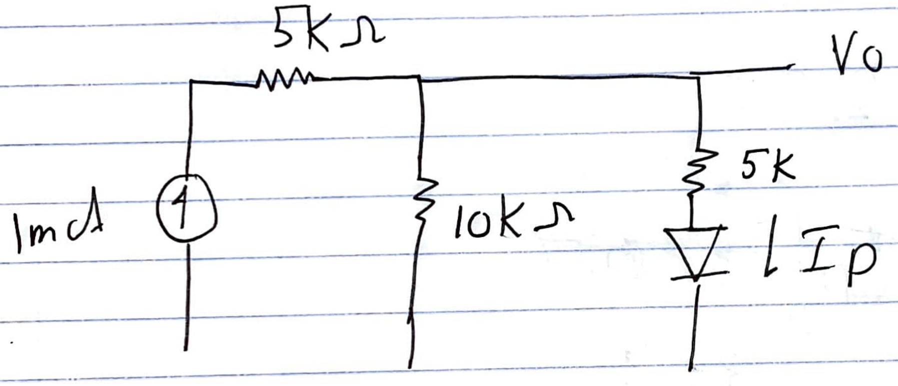


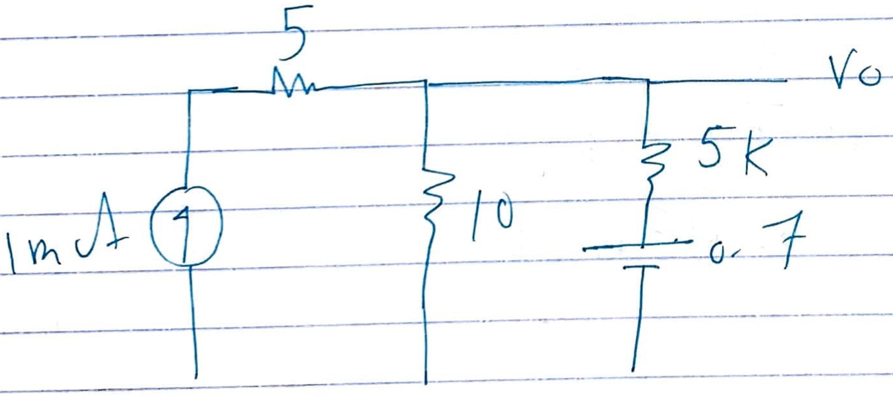
$$-2.85 + 0.7 + 5I_p = 0$$

$$I_p = 0.43 mA$$

For the Circuit Shown, using the knee Voltage model find I_D





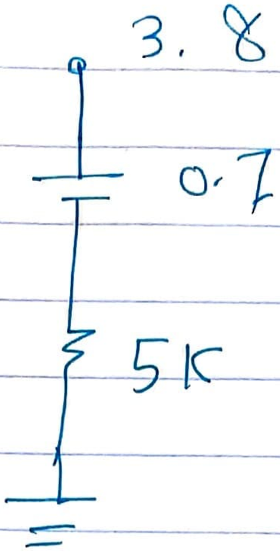


$$-1mA + \frac{Vo}{10} + \frac{Vo - 0.7}{5K} = 0$$

$$Vo\left[\frac{1}{5} + \frac{1}{10}\right] = \frac{0.7}{5} + 1mA$$

$0.14 + 1 = 1.14$

$Vo = 3.8$

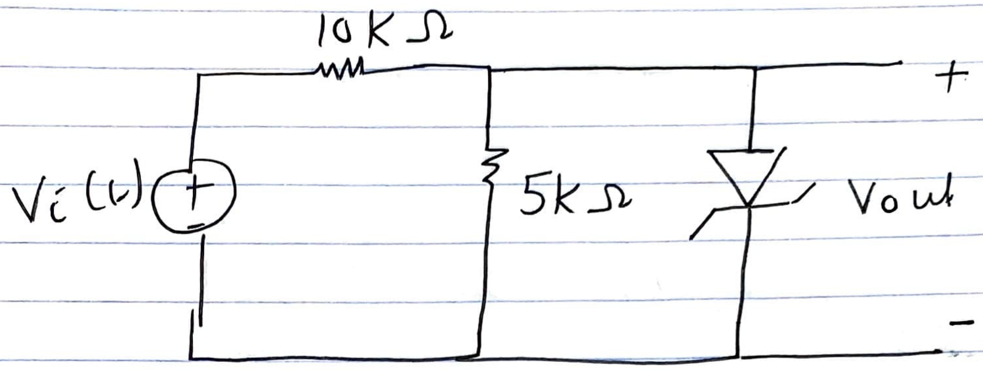


$-3.8 + 0.7 + 5K I_K$

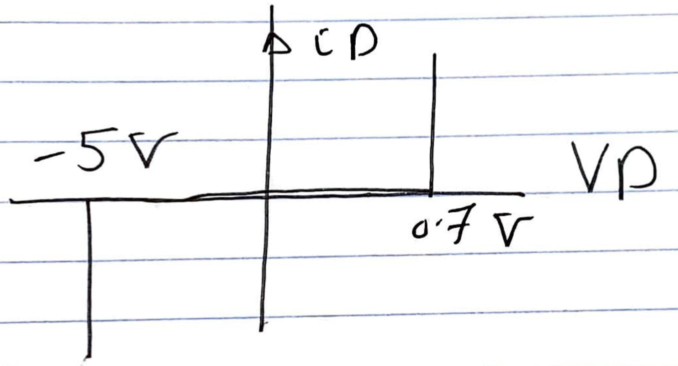
$3.1 = 5 I_D$

$= 0.62$ None of the Listed

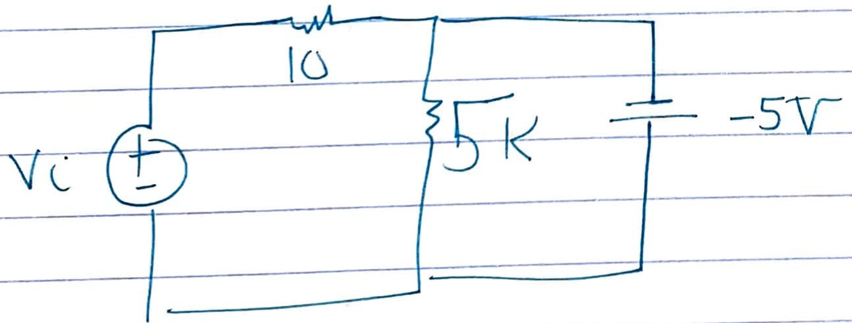
For the circuit shown, for what range will the diode be in the breakdown



V-I characteristic curve



S1 in the break down when $V_D \leq -5$

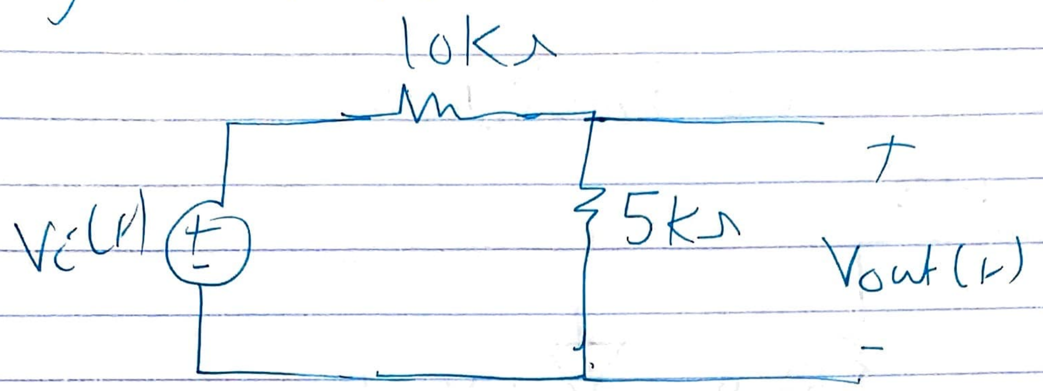


Voltage divider

$$\frac{V_i \times 5}{15} \leq -5$$

$V_i \leq -15$ less than 15

S2) when Zener diode is disconnected

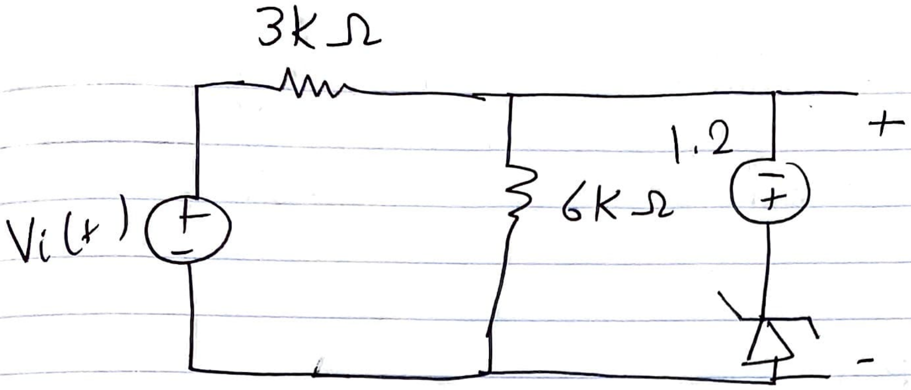


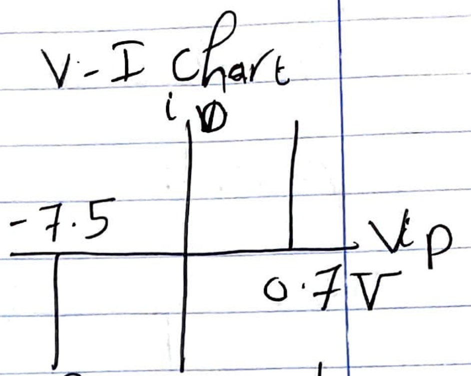
$$V = \frac{5}{15} \times V_i(t) = \frac{1}{3} V_i(t)$$

Zener is in breakdown $V_o(t) \leq 5V$

$$\frac{1}{3} V_i \leq -5$$

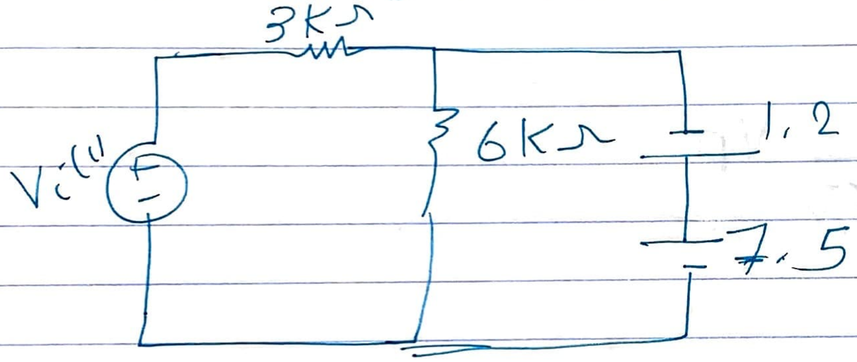
$$V_i \leq -15$$



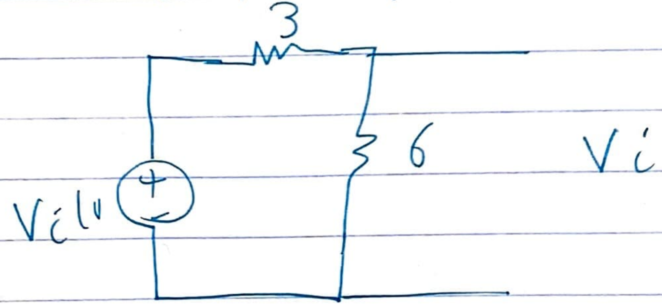


For what range of Vi(t) will the diode be in the breakdown region.

when $V_D < -7.5$



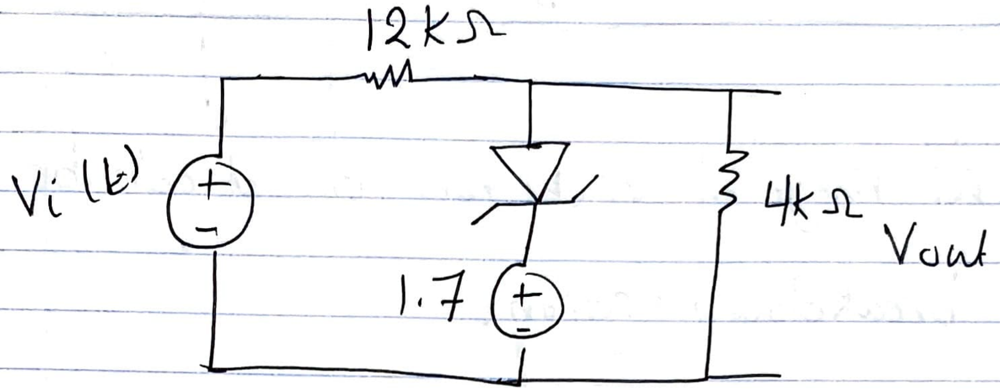
$V_{out} = 7.5 - 1.2 = 6.3$

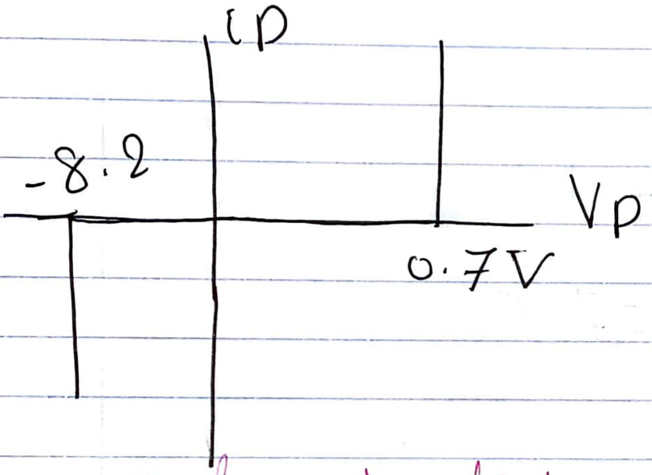


$V_{out} = \frac{6 \times V_i}{9}$

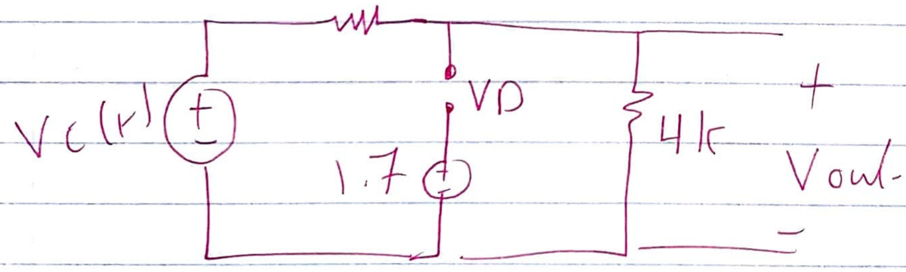
9.45 greater than

For the circuit shown, for what range of Vi(t) will the diode be in the break down region





Before break down iD = 0 — open circuit



$V_o = V_i \times \frac{4}{12+4}$ $V_o = \frac{V_i}{4}$

$V_D = \frac{V_i}{4}$ Voltage at positive terminal

$V_- = 1.7$ = Voltage at negative terminal

Voltage across the diode

$V_D = \frac{V_i(+)}{4} - 1.7$

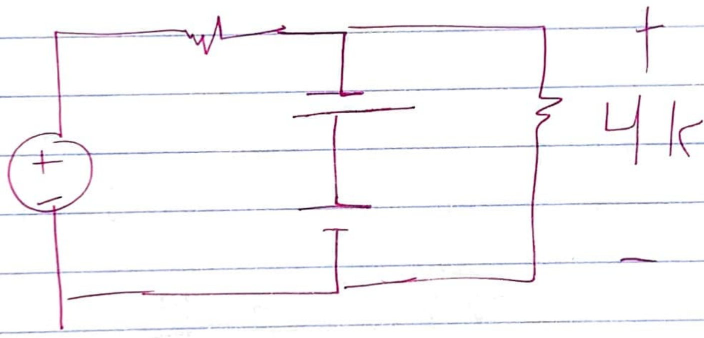
$V_D < -8.2$

$\frac{V_i}{4} - 1.7 < -8.2$

< -6.5

$V_i < -26$

S2)



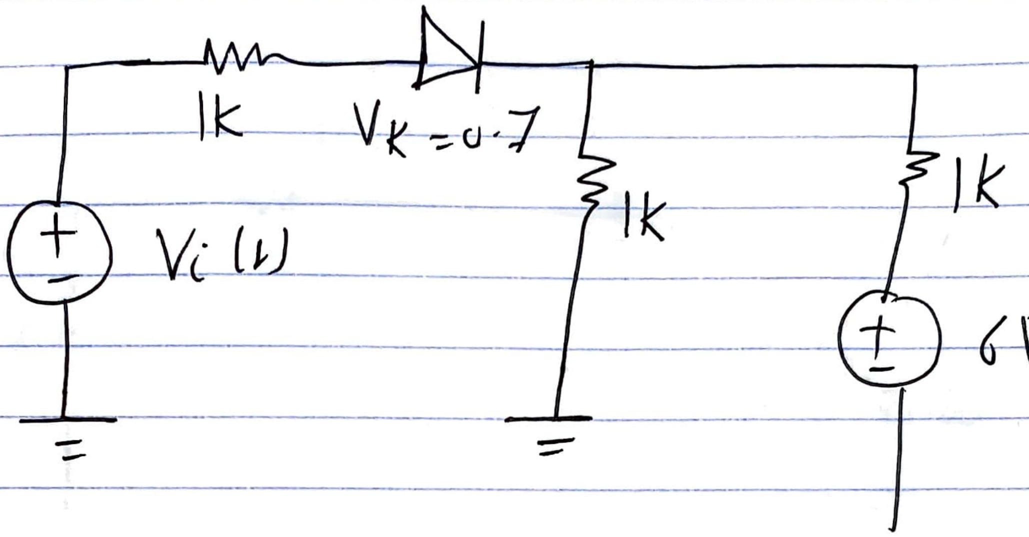
$+ V_o - 8.2 + 1.7 = 0$

$V_o < 6.5$

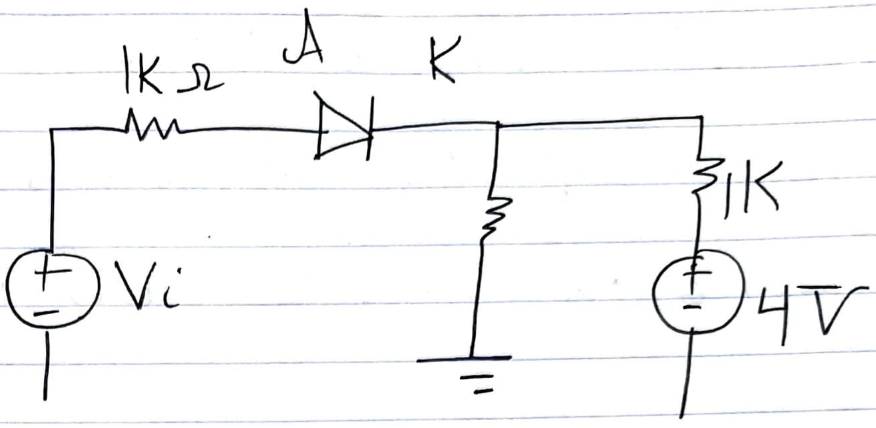
$\frac{V_i \times 4}{12} < 6.5$

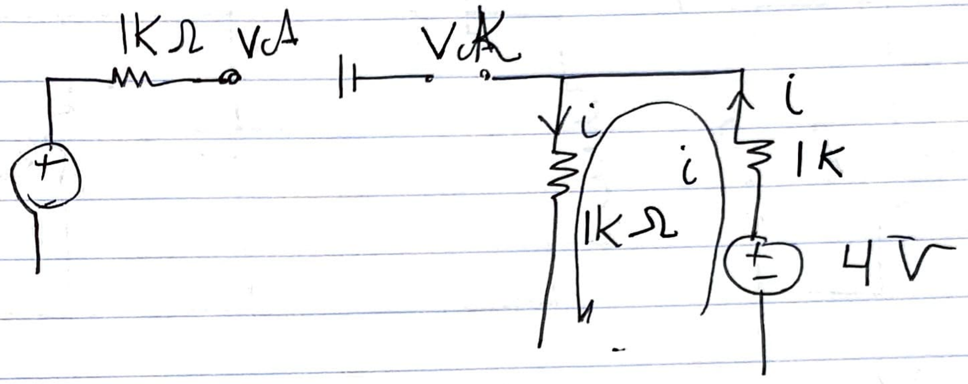
$V_i < -26$ V

For the circuit shown, for what range of $V_i(t)$ will the diode be off.



For what range of Vi(t) will the diode be off





VA = Vi (1)

VK = 1 X i

$= 1 \times \frac{4-0}{2}$ = 2 V

To turn off the diode

VA − 0.7 < VK

Vi (t) − 0.7 < 2

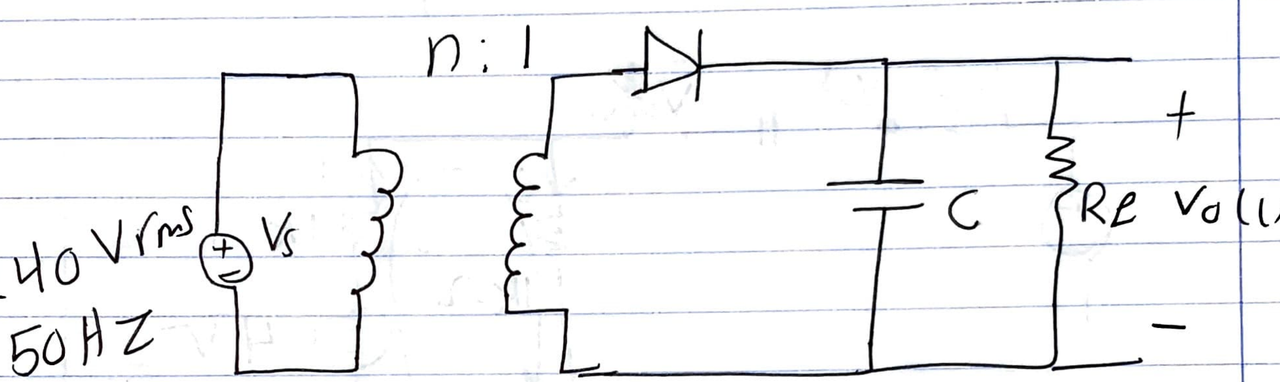
Vi < 2.7

The circuit shown is to be designed so that

$V_{L,dc} = 12V$ $V_{Lr,p-p} = 4V$

1) The required capacitor C is equal to

2) The required turns ratio n is equal to



$$V_p = \sqrt{2} \times 240$$

$$V_p = 339.41$$

$$V_s = 12V$$

$$\frac{V_s}{V_p} = \frac{n_s}{n_p} \qquad n_p = 28$$

a) $C = \frac{I \times t}{\Delta V}$ $\qquad t = \frac{1}{f}$

$$f = 50HZ$$

$$C = 0.7$$

حل

$V_{L,dc} = 12\ V$

$V_L = V_m - \frac{1}{2} V_{L\,rp-p}$

$V_m = 14\ V$

$V_{L\,rp-p} = \frac{V_m}{f_o RC}$

$4 = \frac{14}{50 \times 100 \times C}$

$C = 7 \times 10^{-4}$

$V_m = \frac{N_s}{N_p} \cdot V_{mp}$

$14 = \frac{1}{n} \times \frac{240}{\sqrt{2}}$

$n = 12.12$