Sir Syed University of Engineering & Technology (SSUET)

Computer Engineering Department

Course Name: Basic Electronics

Semester: Spring 2011, 3rd

Batch: 2010(Sections: A,B)

Assignments # 3

Course Responsible

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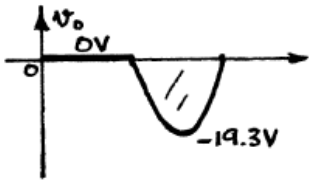
SIR SYED UNIVERSITY OF ENGINEERING AND TECHNOLOGY
COMPUTER ENGINEERING DEPARTMENT
BASIC ELECTRONICS
2010 BATCH (Sections: A, B)
Last Submission Date: Will announce in Class.

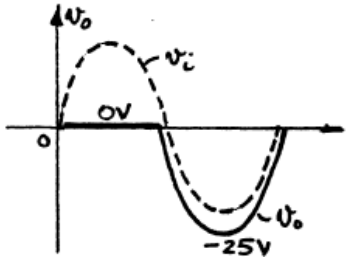
Assignment #3

Q32.

(a)
Si diode open for positive pulse of v_i and $v_o = 0V$
For $-20V < v_i \leq -0.7V$ diode "on" and $v_o = v_i + 0.7V$
For $v_i = -20V$, $v_o = -20V + 0.7V = -19.3V$
For $v_i = -0.7V$, $v_o = -0.7V + 0.7V = 0V$



(b) For $v_i \leq 5V$ the 5V battery will insure the diode is forward-biased and $v_o = v_i - 5V$
at $v_i = 5V$
$v_o = 5V - 5V = 0V$
at $v_i = -20V$
$v_o = -20V - 5V = -25V$
For $v_i > 5V$ the diode is reverse-biased and $v_o = 0V$

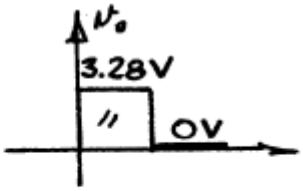


Q33.

(a) Positive pulse of v_i:

$$V_o = \frac{1.2k\Omega(10V - 0.7V)}{1.2k\Omega + 2.2k\Omega} = 3.28V$$

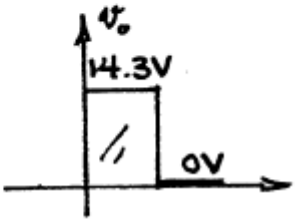
Negative pulse of v_i:
diode "open", $v_o = 0V$



(b) Positive pulse of v_i:

$$V_o = 10V - 0.7V + 5V = 14.3V$$

Negative pulse of v_i:
diode "open", $v_o = 0V$



Q34.

:(a)

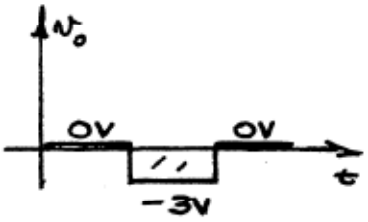
For $v_i = 20V$ the diode is reverse-biased and $v_o = \underline{0V}$.

For $v_i = -5V$, v_i overpowers the 2V battery and the diode is "on".

Applying Kirchhoff's voltage law in the clockwise direction:

$$-5V + 2V - v_o = 0$$

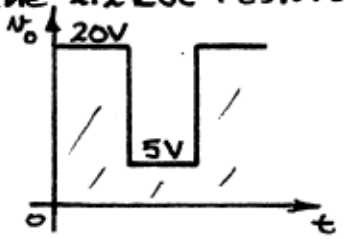
$$v_o = \underline{-3V}$$



(b)

For $v_i = 20V$ the 20V level overpowers the 5V supply and the diode is "on". Using the short-circuit equivalent for the diode we find $v_o = v_i = \underline{20V}$.

For $v_i = -5V$, both v_i and the 5V supply reverse-bias the diode and separate v_i from v_o. However, v_o is connected directly through the 2.2kΩ resistor to the 5V supply and $v_o = \underline{5V}$

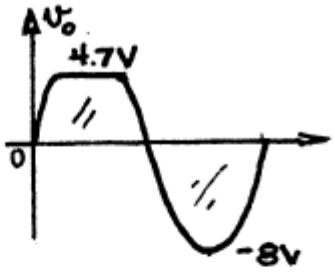


Q35.

(a) Diode "on" for $v_i \geq 4.7V$

For $v_i > 4.7V$, $V_o = 4V + 0.7V = 4.7V$

For $v_i < 4.7V$, diode "off" and $v_o = v_i$



(b) Again, diode "on" for $v_i \geq 4.7V$ but v_o now defined as the voltage across the diode

For $v_i \geq 4.7V$, $v_o = 0.7V$

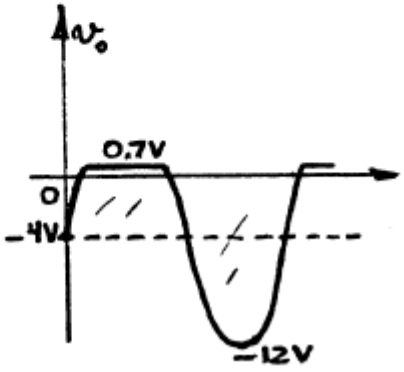
For $v_i < 4.7V$, diode "off",

$I_D = I_R = 0mA$ and $V_{2.2k\Omega} = IR = (0mA)R = 0V$

therefore, $v_o = v_i - 4V$

at $v_i = 0V$, $v_o = -4V$

$v_i = -8V$, $v_o = -8V - 4V = -12V$



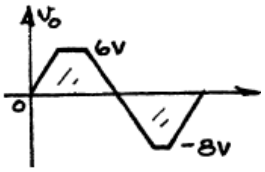
Q36.

For the positive region of v_i:

The right Si diode is reverse-biased.

The left Si diode is "on" for levels of v_i greater than $5.3V + 0.7V = 6V$. In fact, $v_o = 6V$ for $v_i \geq 6V$

For $v_i < 6V$ both diodes are reverse-biased and $v_o = v_i$.



For the negative region of v_i:

The left Si diode is reverse-biased.

The right Si diode is "on" for levels of v_i more negative than $7.3V + 0.7V = 8V$. In fact, $v_o = -8V$ for $v_i \leq -8V$

For $v_i > -8V$ both diodes are reverse-biased and $v_o = v_i$.

i_R: For $-8V < v_i < 6V$ there is no conduction through the 10kΩ resistor due to the lack of a complete circuit. Therefore, $i_R = 0mA$

For $v_i \geq 6V$

$$v_R = v_i - v_o = v_i - 6V$$

For $v_i = 10V$, $v_R = 10V - 6V = 4V$

and $$i_R = \frac{4V}{10k\Omega} = 0.4mA$$

For $v_i \leq -8V$

$$v_R = v_i - v_o = v_i + 8V$$

For $v_i = -10V$

$$v_R = -10V + 8V = -2V$$

and $$i_R = \frac{-2V}{10k\Omega} = -0.2mA$$