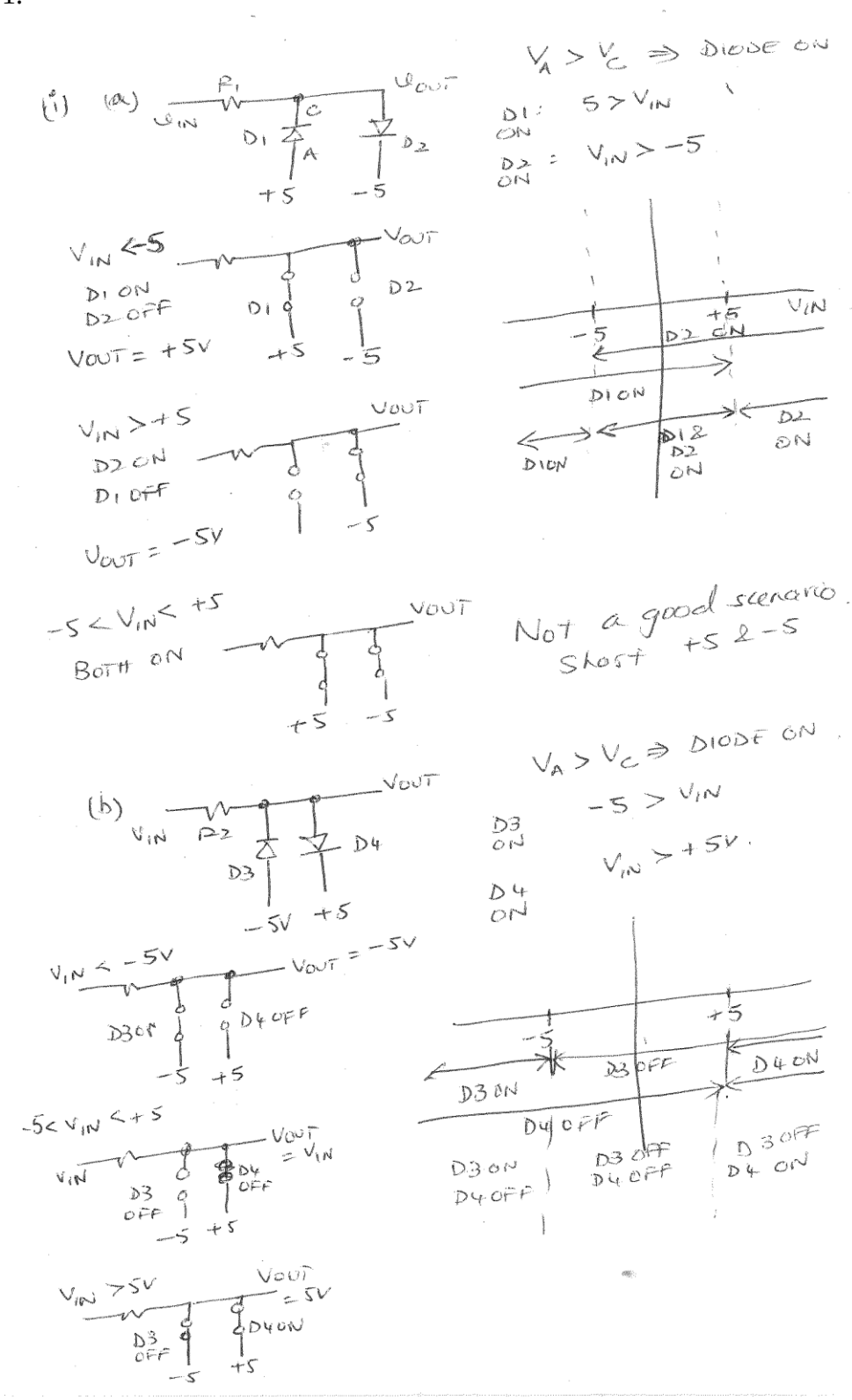
SANTA CLARA UNIVERSITY	ELEN 115 – Spring 2023	S. Krishnan

Homework #6 Solutions

1.

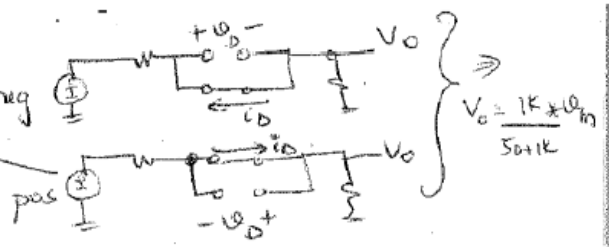


(ii) (b) functions as a clamp.
as Vout stays below +5 & above −5
& for the in between range Vout = Vin.

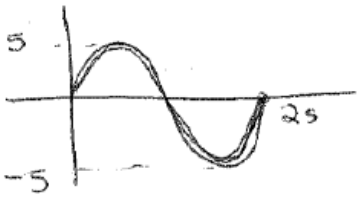
(iii) (a) Does NOT function as a clamp
as it shorts out the +5V & −5V for some
input conditions.

2.

(i) $v_{IN} < 0$ D_b turns on
$v_{IN} > 0$ D_a turn on



(ii) $v_{out} = \frac{1000}{1050} v_{IN} \cong v_{IN}$



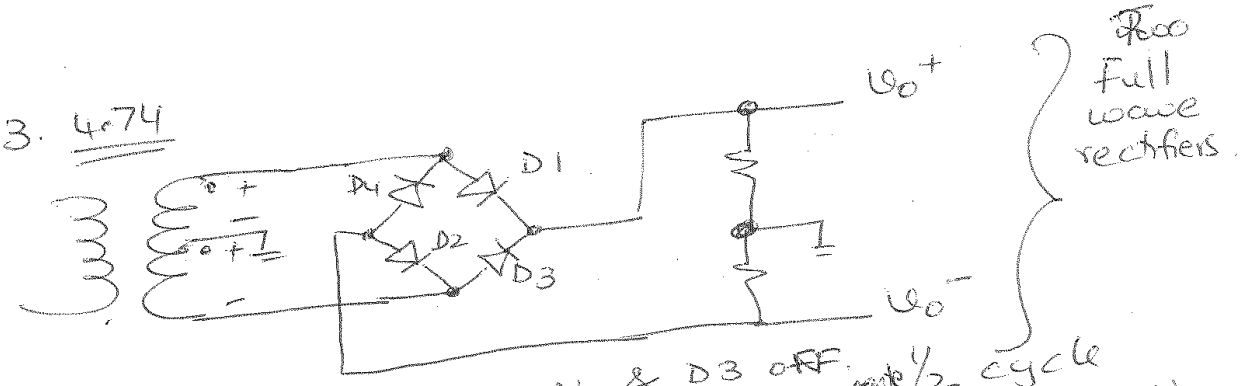
(iii) $v_{avg} = 0$

(iv) Not an efficient rectifier
as get zero average.

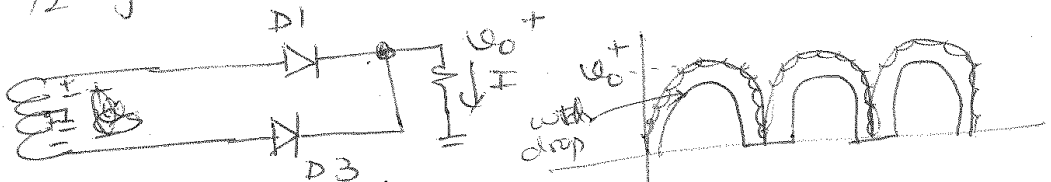
$\hat{i}_{Da} = \frac{5V}{1050}$ & $\hat{i}_{Db} = \frac{0-(-5)}{1050} \Rightarrow \hat{I}_{Da} = \hat{I}_{Db} = \frac{5}{1050} =$

(v) each diode sees the other diode
shorted across its terminals $\Rightarrow$ PIV = 0V

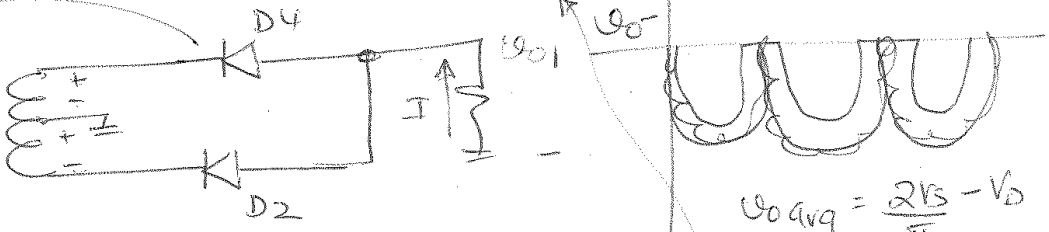
3. 4.74



positive ½ cycle D1 ON & D3 OFF. negate ½ cycle D1 OFF D3 ON.



PIV $V_S - V_o = V_S + (V_S - 0.7) = 2V_S - 0.7$
$= 39.2V$



positive ½ cycle & D2 ON, D4 OFF
negative ½ cycle D2 OFF, D4 ON.

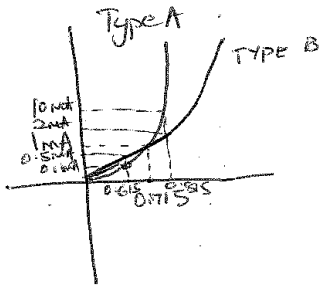
$v_{o\,avg} = \frac{2V_S}{\pi} - V_D$

$12V = \frac{2V_S}{\pi} - 0.7$

$V_S = 19.95V$ //

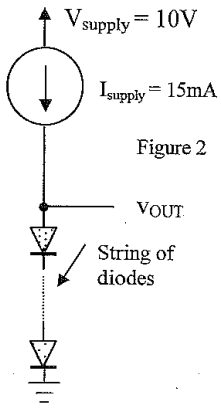
4.

(i)



Type B
ΔV change larger for large change in I.

So should choose Type A.



(ii) $v_2 = v_1 + nV_T \ln \frac{i_2}{i_1}$

$0.1V = nV_T \ln \frac{10mA}{1mA}$

$nV_T = 0.0434mV$

$v_2 = 0.715 + 0.0434 \ln \frac{15mA}{1mA} = 0.8326V = v_{diode}$

$V_{out} = N * v_{diode}$

To get 5V $N * 0.8326 = 5 \Rightarrow N = 6.005$
$\approx$ 6 diodes.

(iii) when $I_L = 5mA \Rightarrow I_{diode} = 15mA - 5mA = 10mA$.
$\Rightarrow v_{diode} = 0.815$ as seen in graph

$V_{out} = 6 * 0.815 = 4.89V$

% change $= \frac{4.89 - 5}{5} * 100 \approx -2.2\%$.