American International University- Bangladesh (AIUB)
Faculty of Engineering

Course Name:	Electronic Devices	**Course Code:**	EEE 2103
Semester:	Spring 2022-23	**Section:**	K
Faculty:	DR. MD. KABIRUZZAMAN	Term	Mid

Assignment No:	1
CO Number	**CO1** [**Apply the semiconductor diode principles in the practical application having different electronic arrangements**]
POI Number	**P.b.1.C4** with K1 [Identify first principles of natural sciences and engineering sciences in practical applications]

Student Name:	MD. SHOHANUR RAHMAN SHOHAN	**Student ID:**	22-46013-1

Submission Date:	28 February, 23	**Due Date:**	28 February, 23, 11:59 PM

Marking Rubrics (to be filled by Faculty):

Problems	Excellent [14]	Proficient [11-13]	Good [9-12]	Acceptable [7-8]	Needs Improvement [3-6]	Unacceptable [1-2]	No Response [0]	Secured Marks
(i) (K1)	Detailed unique response explaining the systematic diode theories properly and answer is correct with all works clearly shown.	Response with no apparent errors and the answer is correct, but systematic diode theories explanation is not adequate.	Response shows understanding of the problem, but the systematic diode theories applications/explanations may not be correct.	Partial problem is solved; response indicates part of the problem was not understood clearly and partial application of systematic diode theories.	Partial problem solved with minor error that needs to be fixed.	Unable to clarify the understanding of the problem and systematic diode theories.	No Response	
Problems	Excellent [6]	Proficient [5]	Good [4]	Acceptable [3]	Needs Improvement [2]	Unacceptable [1]	No Response [0]	Secured Marks
(ii) (K1)	Detailed unique response explaining the concept properly and answer is correct with all works clearly shown.	Response with no apparent errors and the answer is correct, but explanation is not adequate/unique.	Response shows understanding of the problem, but the final answer may not be correct	Partial problem is solved; response indicates part of the problem was not understood clearly.	Partial problem solved with no/vague conclusion regarding optimum choice of component	Unable to clarify the understanding of the problem and method of the problem solving was not correct.	No Response	
Comments							**Total marks (20)**	

INSTRUCTIONS:

In digital logic design laboratory, you need to use the dc power supply to see the NAND operations by using the diodes. Your laboratory uses AC supply of (**ID**+100) V (rms) at 50 Hz. You are asked to design a dc power supply having the output, V_o of [(**last three digits of your ID**) mV X 10]. This output also can be considered as level 1 of two inputs of the NAND gates. Consider the peak voltage of the AC supply is smaller than the PIV of the diodes.

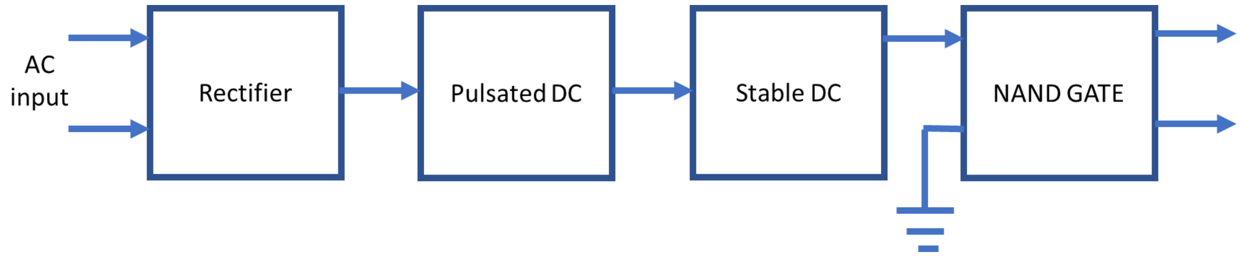


Fig. 1: Block diagram for the signal rectification and NAND gate operation

Hints: If your student ID is 12-34567-8, then **ID** will be 12 and the **last three digits of your ID** are the digits before the hyphen i.e. 567. Moreover, if **last three digits of your ID** is less than 500 then you need to add 500 with that value. For example, **last three digits of your ID** is 400 then 400 + 500 = 900 mV.

Based on this criterion, ***prepare*** *the following:*

i. **Identify** which circuit is necessary for making the DC power supply from AC supply. **Illustrate** input-output signals with appropriate labeling. [14]

ii. Use the output of the dc power supply to **analyze** the NAND operation. [06]

Note: Copied/identical submissions will be graded as 0 for all parties concerned.

i.

My student ID: 22-46013-1

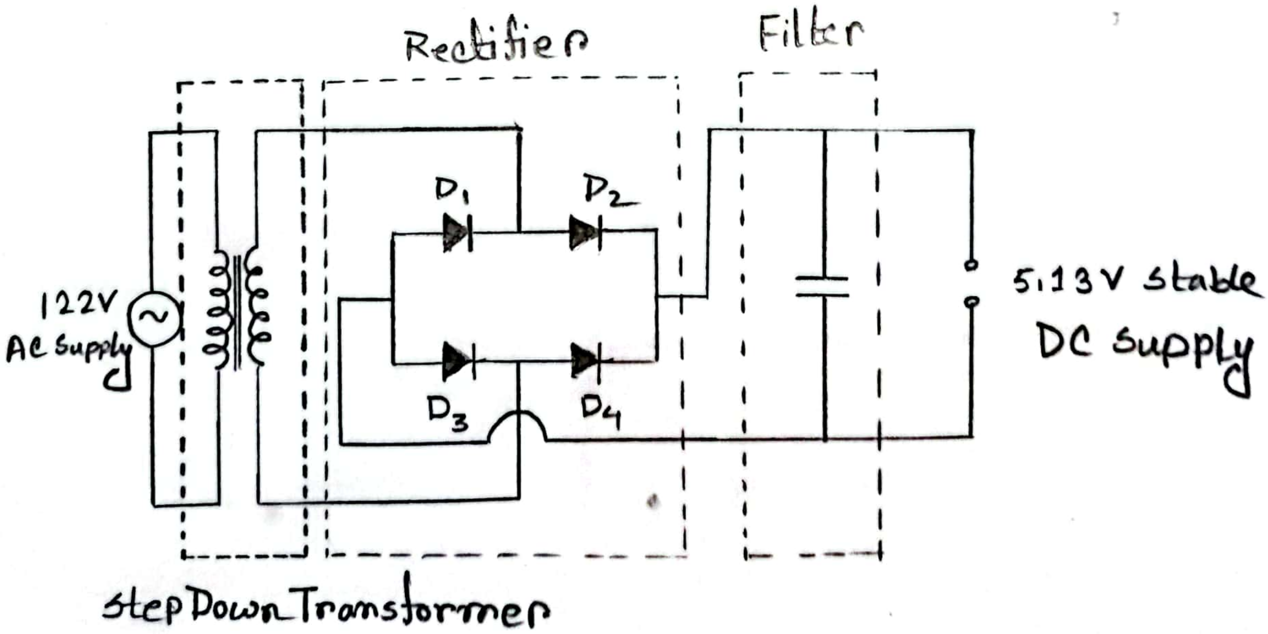
$\therefore$ Input Ac supply, $V_{i\,rms} = (22 + 100)\,V$
$= 122\,V$

As the last three digit of my ID is less than 500. so, I have to add 500 with it.

$\therefore V_o = \{(013+500) \times 10\}\ mV$
$= 5.13\ V$ (DC)

So, $V_{max} = \sqrt{2} \times V_{i\,rms} = \sqrt{2} \times 122 = 172.56\,V$

The circuit figure:



According to the question output voltage V_{dc} will be 5.13V and the supply voltage is 122 V, So to get the output voltage as 5.13 V, we have to control the voltage of Rectifier that will get as input voltage. After that, we have to use a Full wave rectifier to convert the Ac supply to Dc. But Rectifier provide pulsating DC wave form. To eleminate this pulsating we needs to use capacitor as filter to get stable DC.

According to the circuit

For Bridge Rectifier,

$$V_{dc} = .636 \times (V_m - 2V_K)$$

$$5.13 = .636 \times V_m$$

$$V_m = \frac{5.13}{.636} = 8.066\,V$$

here,

$V_{dc} = 5.13V$

$V_K = 0V$ (Ideal diode)

This V_m is the peak voltage of Ac Rectifier input voltage.

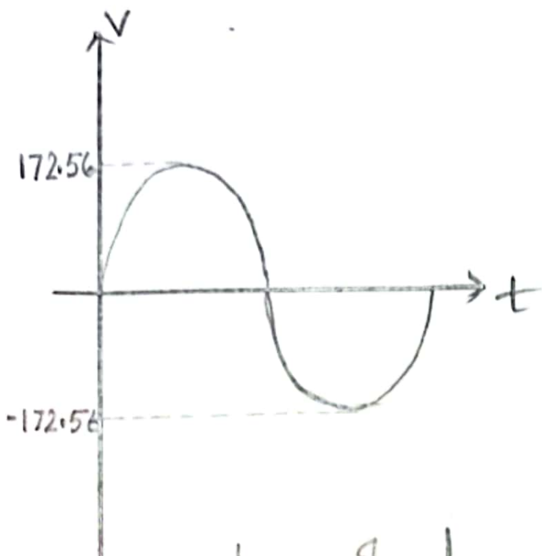
The rms value of V_m will be

$$V_{rms} = 8.066 \times 0.707 = 5.70V$$

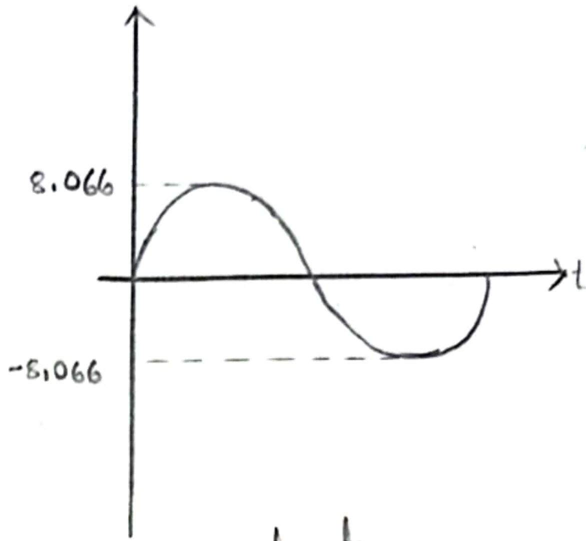
So the Transformer will be stepdown transformer

The turns ratio for this transformer will be.

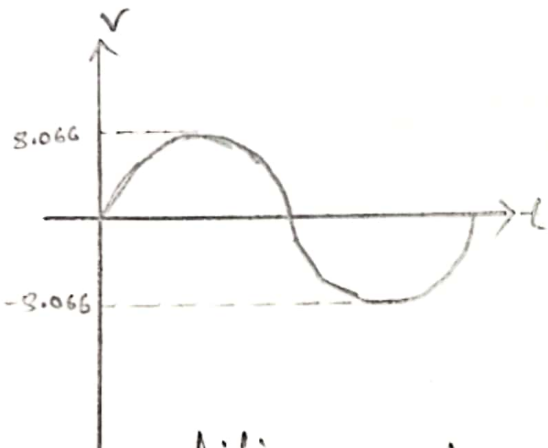
$$n = \frac{V_P}{V_S} = \frac{N_P}{N_S} = \frac{122}{5.70} = 21.403$$



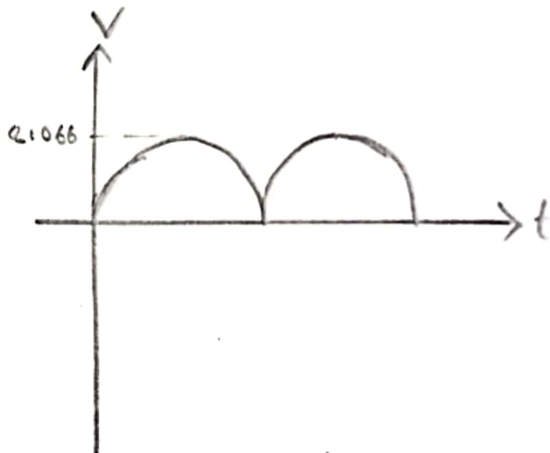
Transformer Input



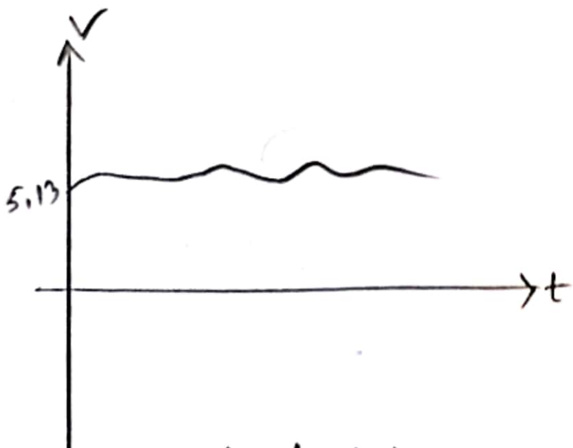
output



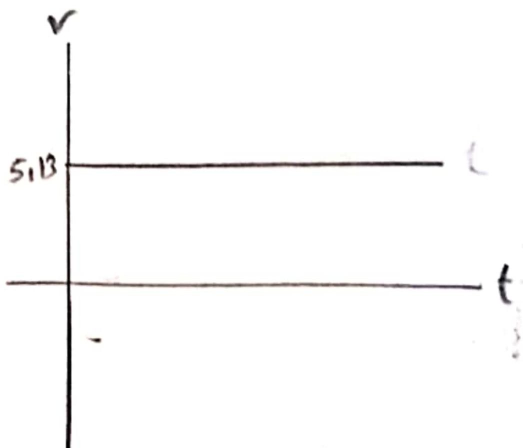
Rectifire Input



out put



Pulsated DC

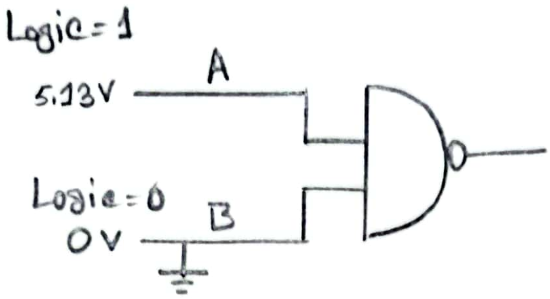


stable DC

ii.

Analysis of NAND Operation:

we get the output of dc supply 5.13 V



Truth table will be:

A	B	output
0	0	1
0	1	1
1	0	1
1	1	0

As B is grounded, so effective truth table will be,

A	B	output
0	0	1
1	0	1

According to truth table it is clear that NAND Gate output will be present only if DC power supply is present at input otherwise output will be zero

when, DC power supply input = 5.13 V
The NAND gate output = 5.13 V
else,
NAND gate output = 0 V