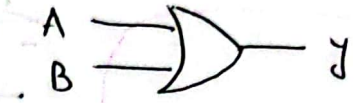
TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

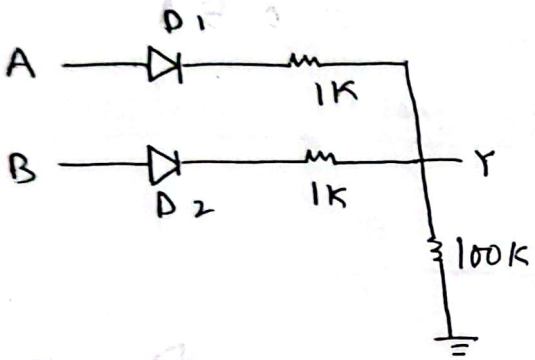
Diode Logic (DL): (AND, OR)

OR Gate



logic 0 (0 - 0.8V)

logic 1 (2 - 5V)



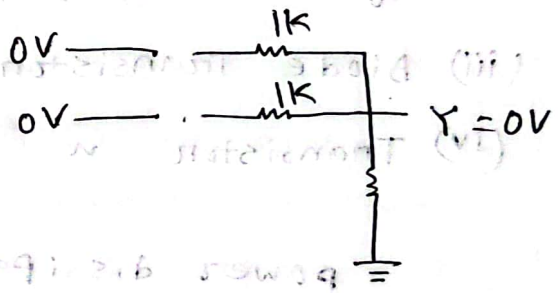
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1 (5V)

Case 1 : (0, 0)

$V_A = 0V$

$V_B = 0V$

$D_1, D_2 \rightarrow$ off



V_A	V_B	V_o
0V	0V	0V
5V	0V	4.25V
0V	5V	4.25V
5V	5V	4.28V

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TOPIC NAME : DAY :

TIME : DATE : / /

case -02 : (1, 0)

$V_A = 5\,V$

$V_B = 0\,V$

Assume, logic 1 = 5 V

logic 0 = 0 V

$D_1 \rightarrow$ on

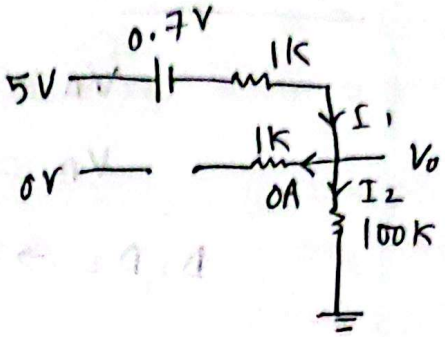
$D_2 \rightarrow$ off

Apply nodal at V_o,

$$I_1 = I_2$$

$$\Rightarrow \frac{5 - V_o - 0.7}{1} = \frac{V_o}{100}$$

$\therefore V_o = 4.25\,V$



$$I_1 = \frac{5 - 4.25 - 0.7}{1}$$

$= 0.05\,mA$

$$I_2 = \frac{4.25}{100}$$

$= 0.0425\,mA$

$P_{dis} = I_1^2(1) + I_2^2(100) + 0.7 I_1$

$= 0.218\,mW$

case 3 : (0, 1)

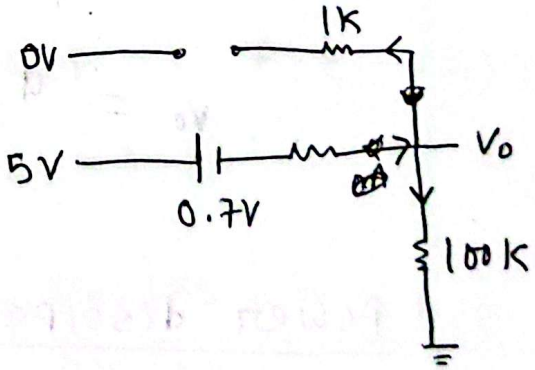
$V_A = 0\,V$

$V_B = 5\,V$

D_1 off, D_2 on

$\therefore V_o = 4.25\,V$

$P_{dis} = 0.218\,mW$



TOPIC NAME : _____ DAY : _____

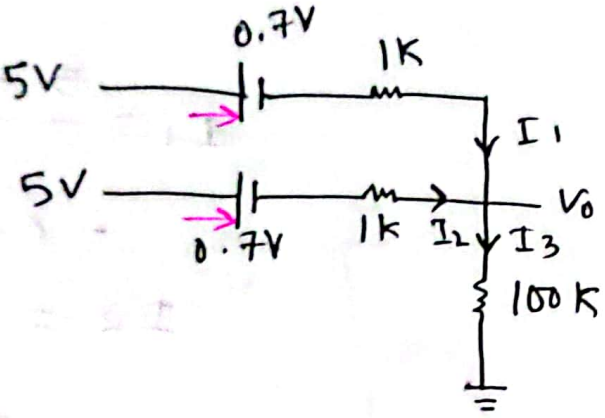
TIME : DATE : / /

case 4 : (1,1)

$V_A = 5V$

$V_B = 5V$

$D_1, D_2 \rightarrow on$



Apply node at v_0,

$$I_1 + I_2 = I_3$$

$$\Rightarrow \frac{5 - V_0 - 0.7}{1} + \frac{5 - V_0 - 0.7}{1} = \frac{V_0}{100}$$

$$\therefore V_0 = 4.28\ V$$

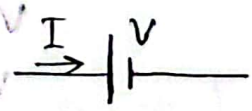
$$I_1 = \frac{5 - V_0 - 0.7}{1} = \frac{5 - 4.98}{1}$$

$$= 0.02\ mA$$

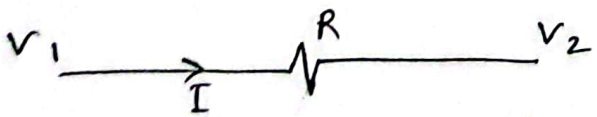
$$I_2 = \frac{5 - V_0 - 0.7}{1} = 0.02\ mA$$

$$I_3 = \frac{V_0}{100} = 0.0428\ mA$$

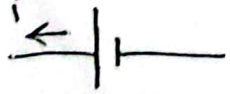
Power dissipation :



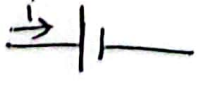
$P_{dis} = VI$



$$P = I^2R = \Delta V I = (V_1 - V_2) I$$



power supply



power dissipate

(if i enter in positive side, power dissi)

TOPIC NAME : DAY :
TIME : DATE : / /

case 4

I → mA
R → KΩ
P → mW

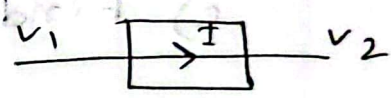
$P_{dis} = I_1^2(1) + I_2^2(1) + I_3^2(100)$
$+ 0.7I_1 + 0.7I_2$
$= 0.211984$ mW

dissipate হচ্ছে তাই $0.7I_1 + 0.7I_2$ হবে। supply হলে কিন্তু add করতে

Alternative

$P = \Delta V I = (5 - 4.28) \times 0.02$
$+ (5 - 4.28) \times 0.02$
$+ (4.28 - 0) \times 0.0428$
$= 0.211984$ mW

যখন V_1 এবং V_2 এর মধ্যদিয়ে same I যায়, তখন এই approach use করা যাবে।



$P = (V_1 - V_2) I$

V_A	V_B	V_0	P_{dis}
0V	0V	0	0
5	0	1.25	0.218
0	5	1.25	0.218
5V	5V	4.28V	0.212mW

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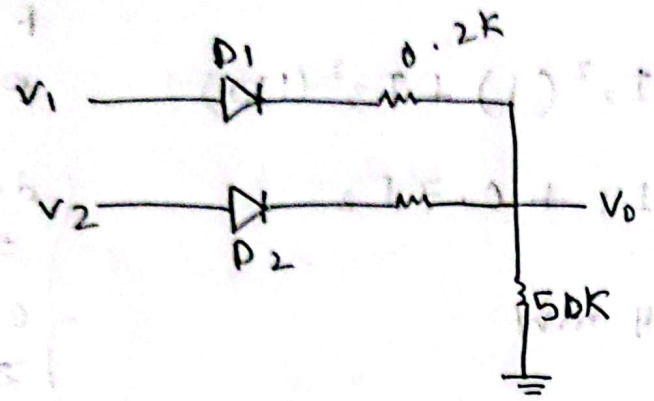
TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Q | Mid Fall 24



$$\begin{cases} P_2 = P_3 \\ \because V_{o_2} = V_{o_3} \end{cases}$$

a) Find the output voltage for the input combination $(V_1 = 0, V_2 = 1)$ and $(V_1 = 0, V_2 = 0)$.

b) Which combination of inputs will show maximum power dissipation.

c) Find average power dissipation.

$$P_{avg} = \frac{P_1 + P_2 + P_3 + P_4}{4}$$

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Submission: Tuesday

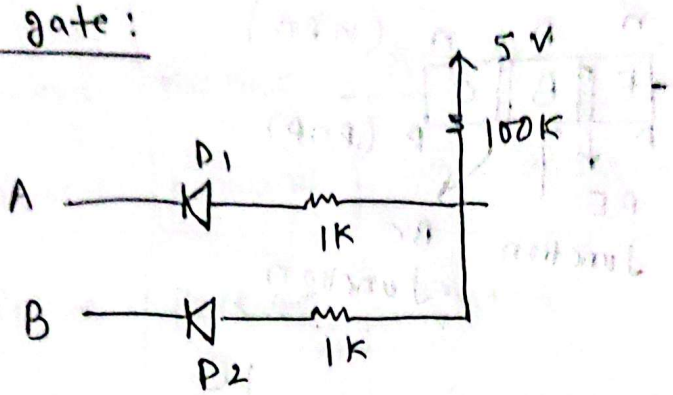
TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Assignment 1

Diode Logic

AND gate :



Logic 1 = 5V

Logic 0 = 0.2 V

$V_\gamma = 0.7$ V

(i) Find output voltage for all input combination

(ii) Find power dissipation ?

(iii) Is it an AND or OR Gate ? Describe ?

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