BRAC UNIVERSITY

CSE 350

Quiz-1, Section 8

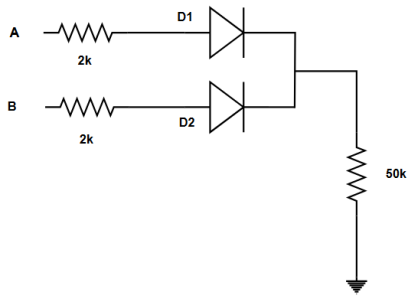
Fall 2024

Marks: 20

Name: ID:

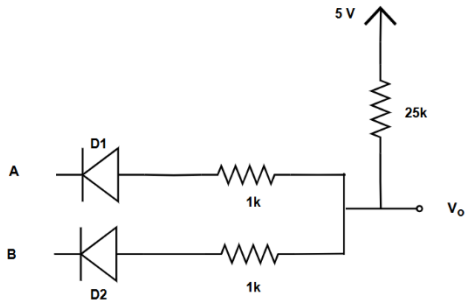
1. According to the circuit, answer the following questions. Here logic high and logic low level are indicated by accordingly 5 V and 0 V.

a. Identify the logic gate. [2]
b. What will be the value of V_{OH} for this logic gate? [8]



2. According to the circuit, answer the following questions. Here logic high and logic low level are indicated by accordingly 5 V and 0 V.

a. Find out the value of V_o for the input, A = 0 and B = 1. [6]
b. Implement Y = AB + C with Diode Logic. [4]

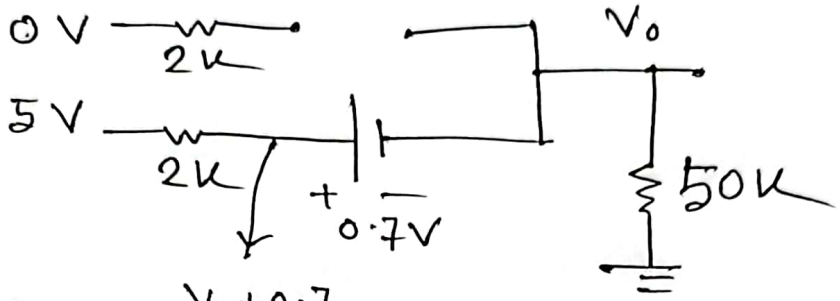


Quiz-1
Section 8

1.a) OR gate

1.b) We will find V_{OH} for 01 or 10 case.

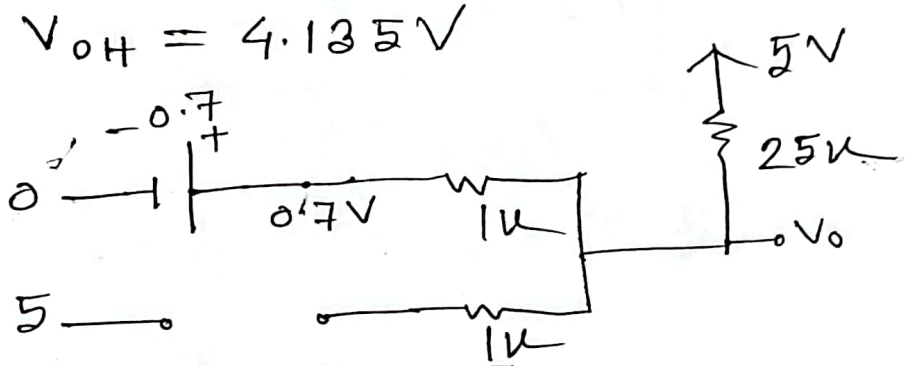
Case (0, 1)



$$\frac{V_o - 0}{50k} + \frac{V_o + 0.7 - 5}{2k} = 0 \Rightarrow V_o = 4.135V$$

$$\therefore V_{OH} = 4.135V$$

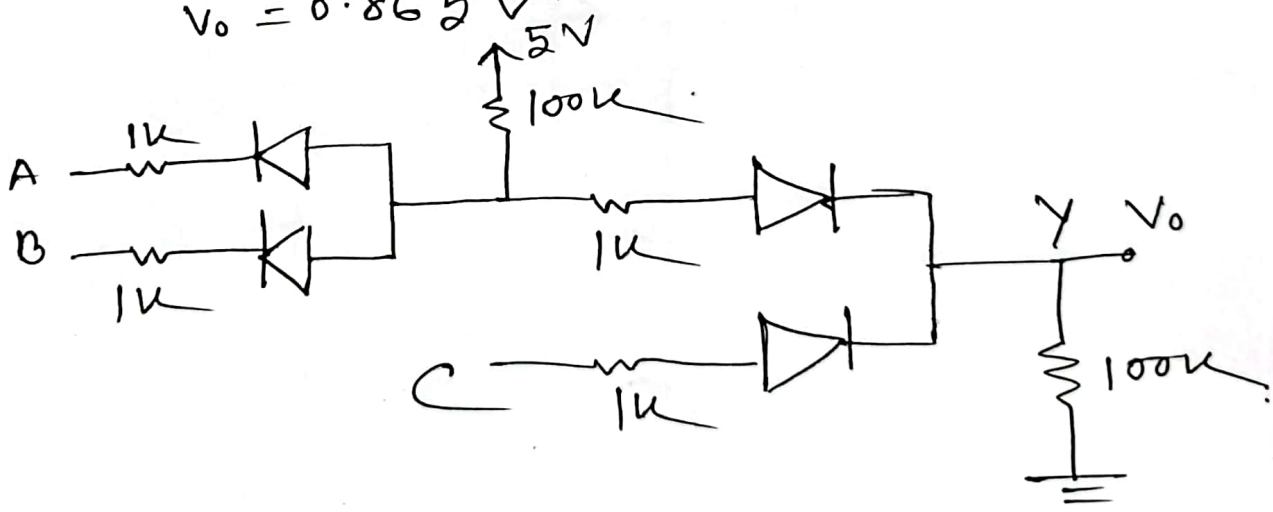
2.a)



$$\frac{V_o - 5}{25k} + \frac{V_o - 0.7}{1k} = 0$$

$$V_o = 0.865\,V$$

2.b)



BRAC UNIVERSITY

CSE 350

Quiz-1, Section 13

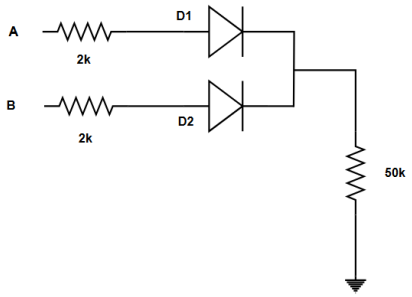
Fall 2024

Marks: 20

Name: ID:

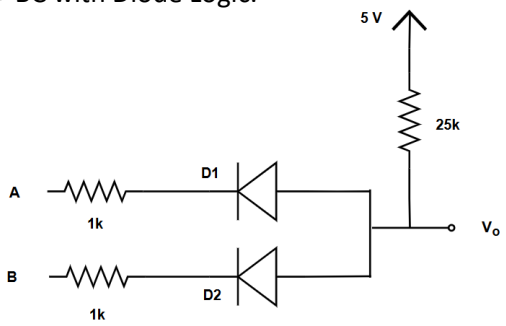
1. According to the circuit, answer the following questions. Here logic high and logic low level are indicated by accordingly 5 V and 0 V.

a. Identify the logic gate. [2]
b. What will be maximum power and minimum power for this logic circuit? [8]



2. According to the circuit, answer the following questions. Here logic high and logic low level are indicated by accordingly 5 V and 0 V.

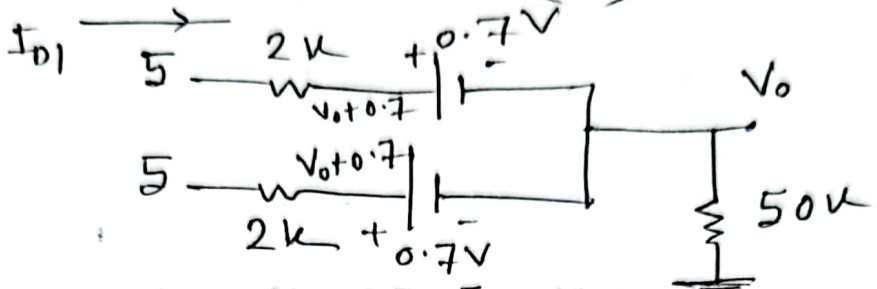
a. Find out the value of Vo for the input, A = 0 and B = 1. [6]
b. Implement Y = A + BC with Diode Logic. [4]



Quiz-12
Section-13

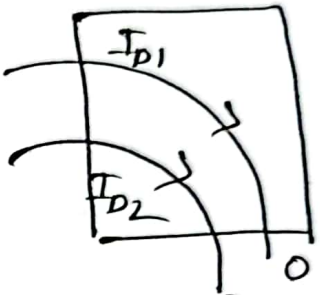
1.a) OR Gate

1.b) Maximum power (1,1)



$$\frac{V_o-0}{50k}+\frac{V_o+0.7-5}{2k}+\frac{V_o+0.7-5}{2k}=0$$

$$\Rightarrow V_o = 4.216V$$

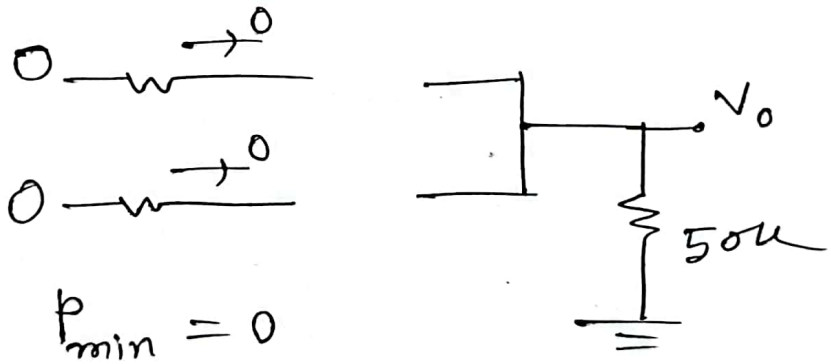


$$I_{D1}=I_{D2}=\frac{1}{2}\times\left(\frac{V_o}{50k}\right) \text{ or } \frac{5-(V_o+0.7)}{2k}$$

$$= 0.04216\,mA$$

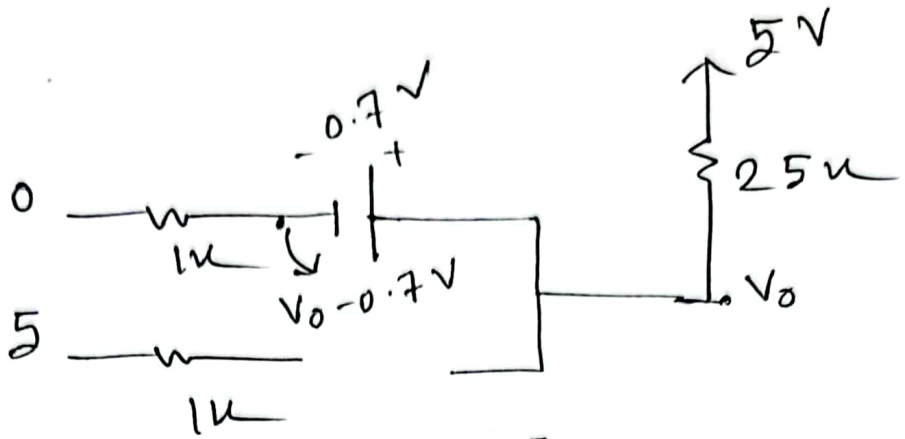
$$P_{max} = (5-0)\times 0.04216 + (5-0)\times 0.04216 = 0.4216\ mW$$

Minimum power



$$P_{min} = 0$$

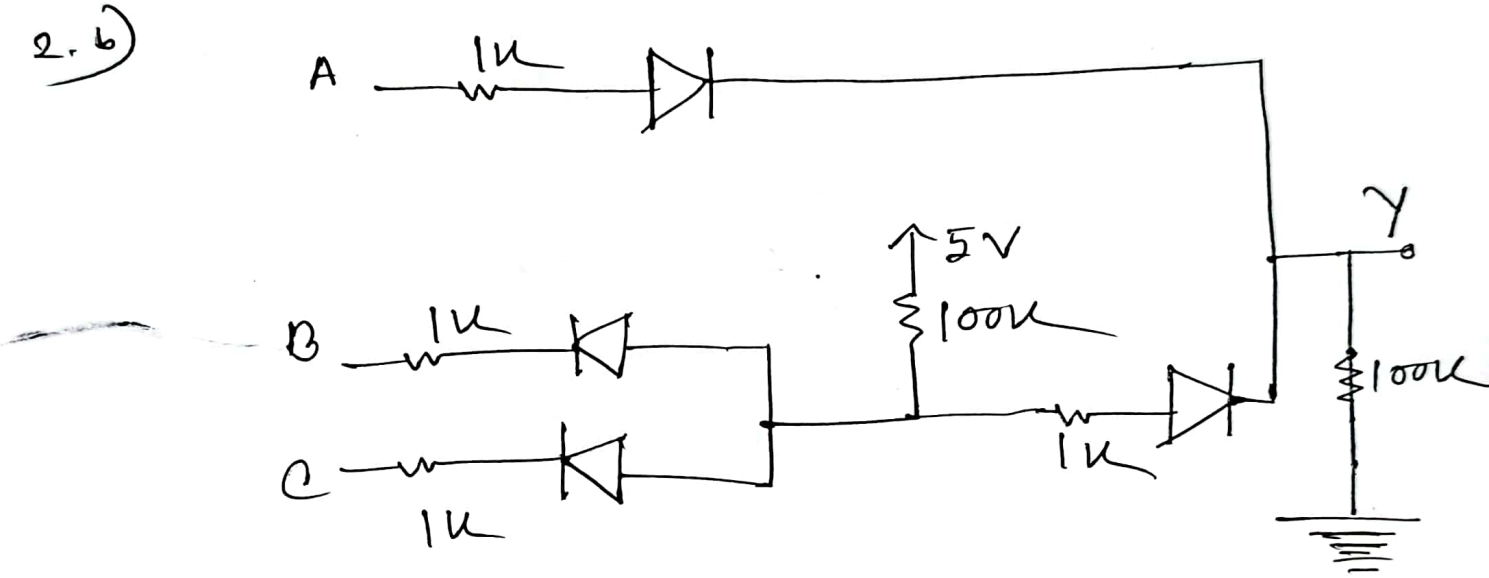
2. a)



$$\frac{V_0 - 5}{25K} + \frac{V_0 - 0.7 - 0}{1K} = 0$$

$$V_0 = 0.865\ V$$

2. b)



BRAC UNIVERSITY

CSE 350

Quiz-2, Section 8

Fall 2024

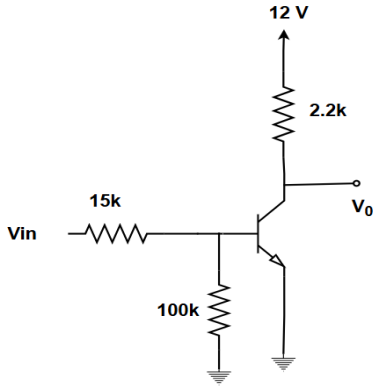
Marks: 20

Name: ID:

1. Answer the following questions considering the given circuit.

[Logic High = 12 V, Logic Low = 0.2 V, $V_{CE}(SAT) = 0.2\,V$ and $V_{BE}(SAT) = 0.8\,V$, $\beta_F = 50$]

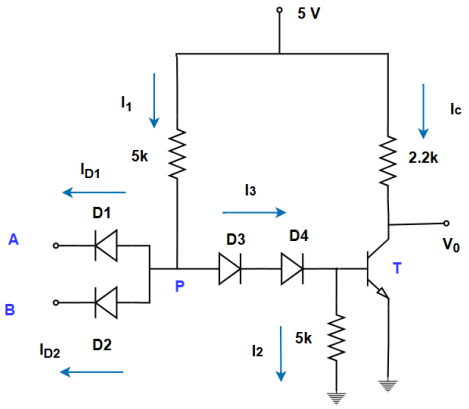
a. What will be the maximum allowable fanout for this RTL inverter? [5]
b. Find the value of I_E of the transistor when the input of the circuit is high. [5]



2. Answer the following questions from the given circuit.

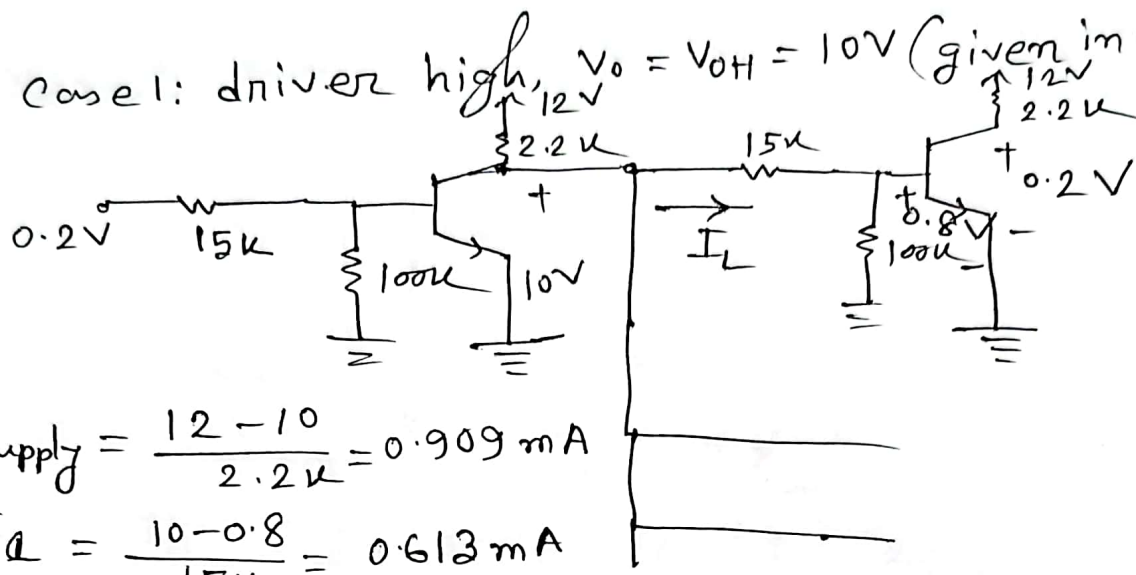
$[Logic\ high\ =\ 5\,V\,, Logic\ low\ =\ 0.2\,V, V_{CE}(SAT)\ =\ 0.2\,V\ and\ V_{BE}(SAT)\ =\ 0.8\,V, \beta F\ =\ 30\,]$

a. Make a truth table for the given logic circuit. [2]
b. Find the value of base current of the transistor when both inputs are high. [8]



Quiz-2
Section-8

1.a) Case 1: driver high, $V_o = V_{OH} = 10V$ (given in Question)



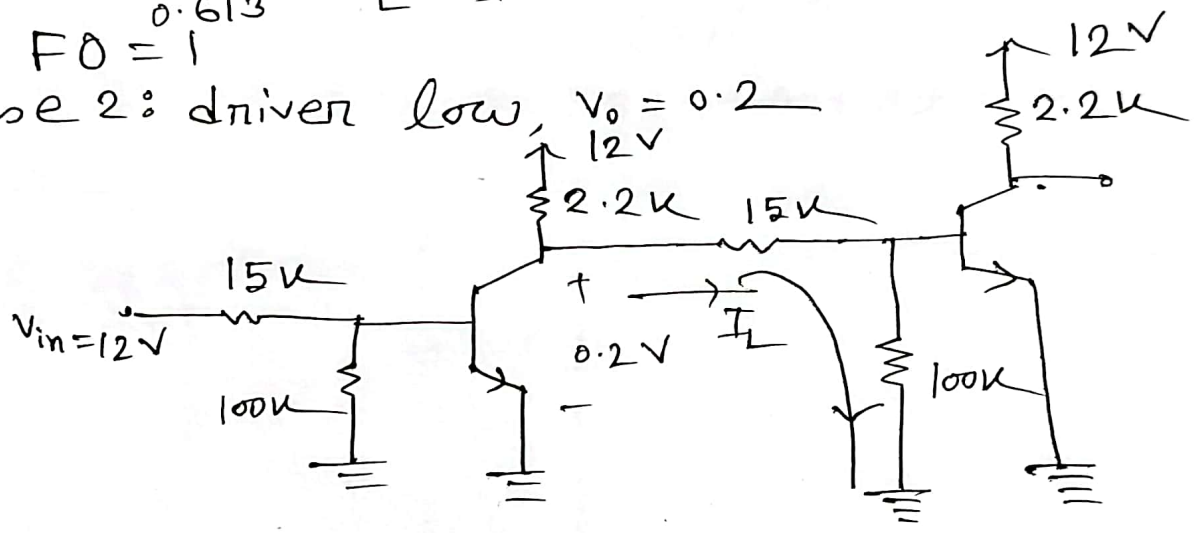
$$I_{supply} = \frac{12-10}{2.2K} = 0.909\ mA$$

$$I_L = \frac{10-0.8}{15K} = 0.613\ mA$$

$$N = \frac{0.909}{0.613} = \lfloor 1.48 \rfloor = 1$$

$$FO = 1$$

Case 2: driver low, $V_o = 0.2$



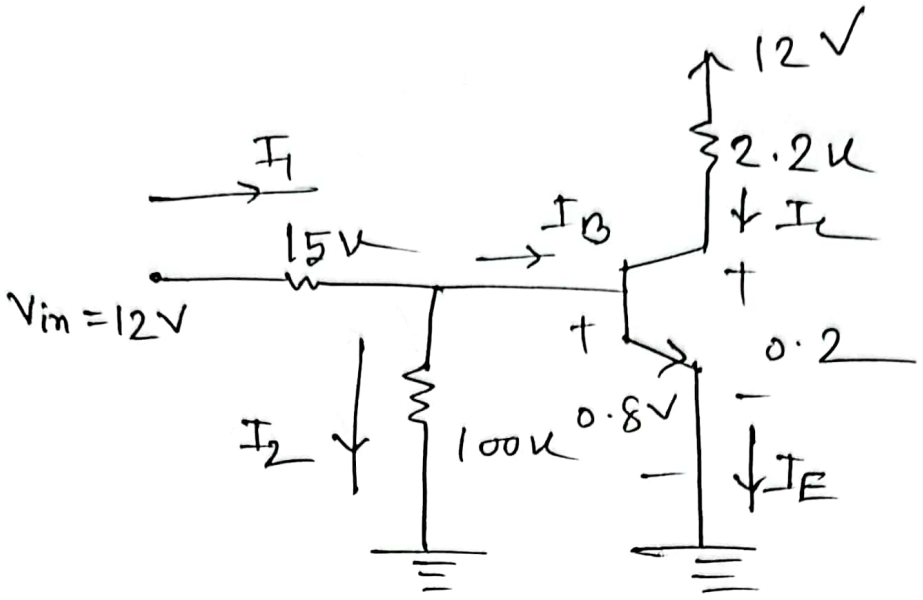
$$I_{supply} = \frac{12-0.2}{2.2K} = 5.364\ mA$$

$$I_L = \frac{0.2-0}{115K} = 1.74 \times 10^{-3}\ mA$$

$$FO = \frac{5.364}{1.74 \times 10^{-3}} = 3084$$

$$FO = Min(3084, 1) = 1$$

1.b)



$$I_1 = \frac{12 - 0.8}{15k}, \quad I_2 = \frac{0.8 - 0}{100k}$$

$$I_B = I_1 - I_2 = \frac{12-0.8}{15k} - \frac{0.8}{100k} = 0.739\,mA$$

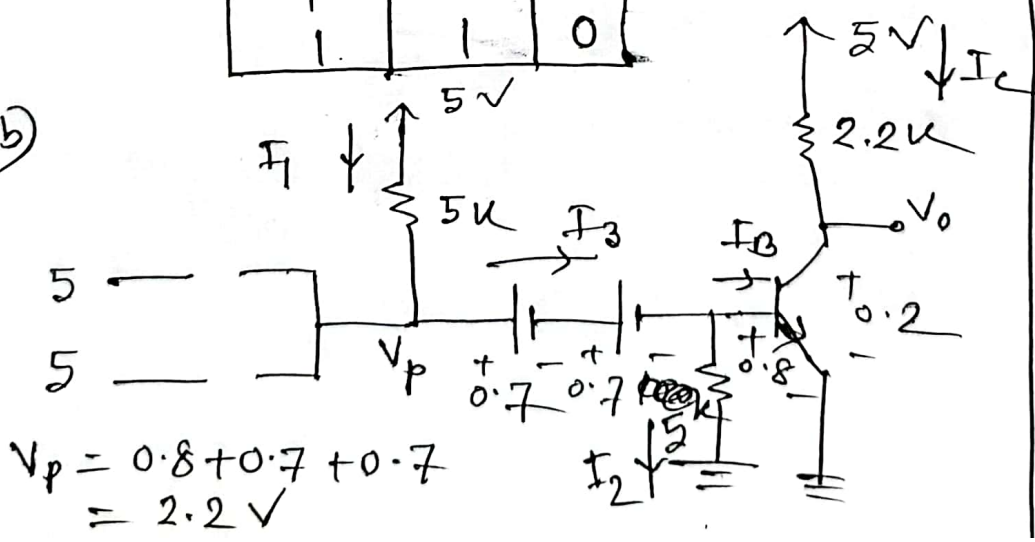
$$I_C = \frac{12-0.2}{2.2k} = 5.364\,mA$$

$$I_E = I_C + I_B = 5.364 + 0.739 = 6.103\,mA$$

2.a) NAND gate

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

2.b)



$$V_p = 0.8 + 0.7 + 0.7 = 2.2\,V$$

$$I_3 = I_1 = \frac{5 - 2.2}{5k} = 0.56\,mA$$

$$I_2 = \frac{0.8 - 0}{5k} = 0.16\,mA$$

$$I_B = I_3 - I_2 = 0.4\,mA$$

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Quiz-2, Section 13

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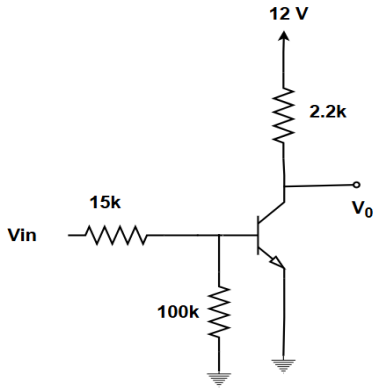
1. Answer the following questions considering the given circuit.

[Logic High = 12 V, Logic Low = 0.2 V, $V_{CE}(SAT) = 0.2\ V$ and $V_{BE}(SAT) = 0.8\ V$]

a. Make a truth table of the logic circuit. [2]
b. Find the average power for the given logic circuit. [8]

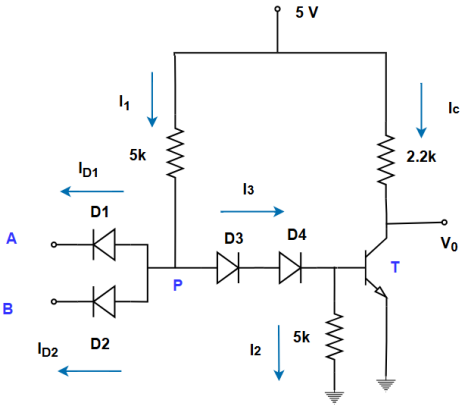


2. Answer the following questions from the given circuit.

$[Logic\ high\ =\ 5\,V\,, Logic\ low\ =\ 0.2\,V, V_{CE}(SAT)\ =\ 0.2\,V\ and\ V_{BE}(SAT)\ =\ 0.8\,V, \beta F\ =\ 30\,]$

a. Find the V_o for the case when both inputs are high. [4]

b. For which input combination the BJT will be in Saturation mode? Find the value of β_{forced} for this BJT in that particular case. [2+4]



Quiz-2

Section-13

1.a) This is a RTL inverter

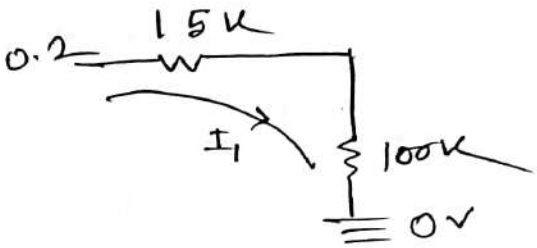
A	Y
0	1
1	0

1.b) Case 1.

$V_{in} = 0.2V$

$I_1 = \frac{0.2-0}{115k}$

$= \frac{1}{575}$ mA



$P_1 = (0.2-0) \times \frac{1}{575} = 3.47 \times 10^{-4}$ mW

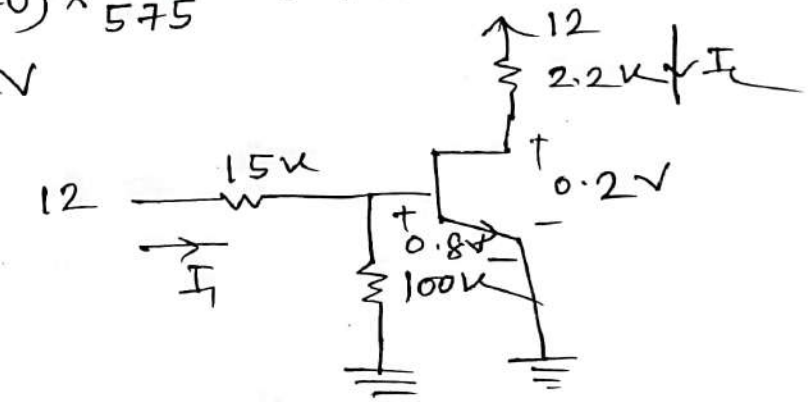
Case 2: $V_{in} = 12V$

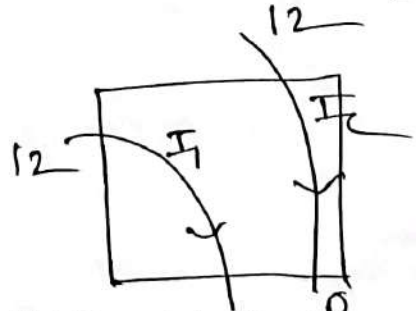
$I_1 = \frac{12-0.8}{15k}$

$= 0.747$mA

$I_c = \frac{12-0.2}{2.2k}$

$= 5.364$mA



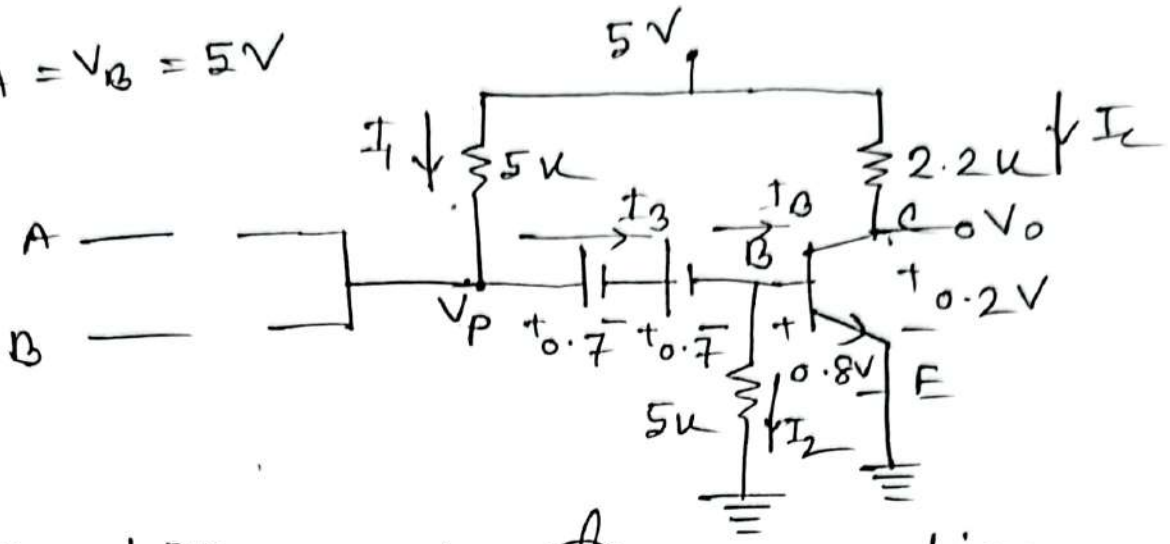


$P_2 = (12-0) \times 0.747$mW $+ (12-0) \times 5.364$mW

$= 73.33$ W

$P_{av} = \frac{P_1 + P_2}{2} = 36.67$ mW

2.a) $V_A = V_B = 5V$



D1 and D2 are in reverse bias

$V_P = 0.7 + 0.7 + 0.8 = 2.2V$

$V_{CE} = V_C - V_E = 0.2$

$\Rightarrow V_o - 0 = 0.2$ $[V_E = 0V, V_C = V_o]$

$\therefore V_o = 0.2V$

2.b) For both inputs logic high values, BJT will be in saturation mode.

$I_1 = I_3 = \frac{5 - 2.2}{5K}$

$I_2 = \frac{0.8}{5K}$

$I_B = I_1 - I_2 = 0.4mA$

$I_C = \frac{5 - 0.2}{2.2K} = 2.18mA$

$\beta_{Forced} = \frac{I_C}{I_B} = \frac{2.18mA}{0.4mA} = 5.45 < 30$