Assignment 2

BRAC University

Semester: Fall 2022
Course No: CSE251   Full Marks: 100
Course Title: Electronic Devices and Circuits   Deadline: **2 November 2022**

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1. Find the values of I and V in the circuit shown below for the following cases:

(i) Assuming the diodes to be ideal.

(ii) Assuming the diodes to be non-ideal *[Hints: use constant voltage drop model with V_{D0}=0.7 V]*.

(iii) Assuming the diodes to be non-ideal and use 5kΩ instead of 10kΩ *[Hints: use constant voltage drop model with V_{D0}=0.7 V].*   **[10×3=30]**
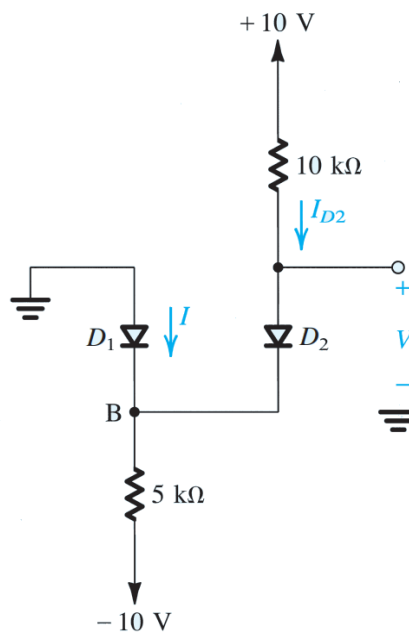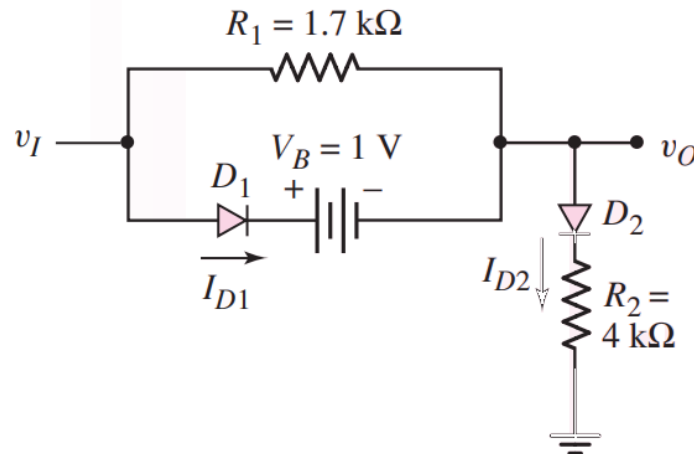
2. Consider the circuit shown in the following Figure. The cut-in voltage of each diode is $V_{D0} = 0.7$ V.

(a) Let $v_1 = (5+$last digit of your ID$\times 10^{-2})$ V. Assume both diodes are conducting. Is this a correct assumption? Why or why not? Determine I_{R1}, I_{D1}, I_{D2}, and v_O **(if necessary, modify the assumption and calculate the values for the correct one).**

[20]

$R_1 = 1.7 \ k\Omega$

v_I

$V_B = 1$ V

D_1

I_{D1}

v_O

D_2

I_{D2}

$R_2 = 4 \ k\Omega$

3. Analyze the circuit shown below. Assume all the diodes to be ideal.

Part a:

(ii) Assuming w, x, y, z are boolean variables, **analyze** the circuit to find an expression of ckt-1 (the dotted ... rectangle) in terms of w and x, and an expression of ckt-2 (the dashed - - - rectangle) in terms of y and z.   [5+5]

(b) **Analyze** the circuit again to find an expression of f in terms of w, x, y, z. Use results from (a).   [5]

Part b: Jawad has created a new ride-sharing app: **Juber**. When you request a Juber ride, Juber's algorithm generates 4 signals to determine whether it will be forwarded to a rider. (1) Signal F determines if the rider is free. (2) Signal R determines if the rider is within close proximity. (3) Signal G determines if the rider has a good rating. (4) Signal N determines if the rider is new. If both conditions 1 and 2 are satisfied, and either condition 3 or condition 4 are satisfied, the request will be connected.

(c) Deduce the logic function using boolean signals F, R, G, and N to implement Juber's algorithm.   [10]

(d) Design a circuit using ideal diode logic gates to implement this function.   [15]

ckt-1

ckt-2
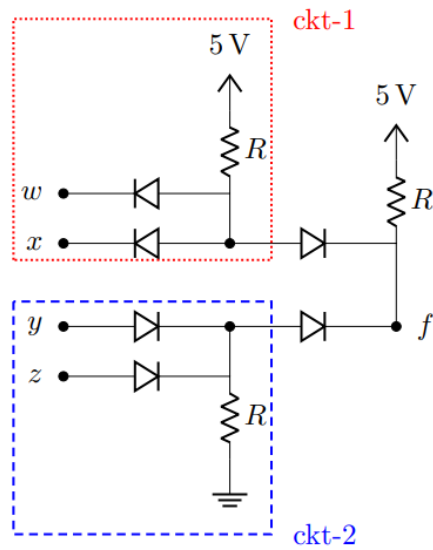
4. Analyze the circuit to find the values of I_{D1}, I_{D2}, v_x, and v_y [$V_{D0} = 0.5$ V]. You must **validate** your assumptions. **[10]**