2020 Spring ELEC 1100 – Lab Homework

Summary Sheet

\*\*Complete the lab homework summary sheet and submit to Canvas before the deadline.

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**\*\*Submission Deadline: upload to your Canvas LA1/LA2/LA3 page before 11:50am (in the morning) on Apr 09 (Thu).**

* 50% penalty mark will be given to a late submission within 3 hours.
* Zero mark will be given to more than 3-hour late submission.

Lab Homework must be submitted as a single **Word document**. It is recommended to follow the scheme given in this summary sheet and directly type in your answers (or draw diagrams, or paste the screenshot of your Tinkercad simulation results). Pasting photos of handwritten steps are acceptable. However, it is your responsibility to ensure that the handwritten parts are readable. Those in cursive handwriting will NOT be graded.

It is allowed to discuss with others regarding the general approaches. It is NOT acceptable to work together on a detailed solution, to copy a solution, or give away a solution.

**This lab homework accounts for 15% of your overall grade.**

**Copying from each other will result in zero mark.**

**Task 1: Resistor Circuit [3 points]**

Q1: Write down the value of your R, 1.5R, 2R.

R=\_\_\_\_\_\_\_\_\_\_\_\_\_kΩ; 1.5R=\_\_\_\_\_\_\_\_\_\_\_\_\_kΩ; 2R=\_\_\_\_\_\_\_\_\_\_\_\_\_kΩ

(Use your own student ID!!! Fail to do so will result in a zero mark in Task 1.)

Q2: Include a screenshot of your “Step 1” Tinkercad simulation result below, show clearly the layout of your breadboard and the reading resistance on multimeter.

Q3: Include a screenshot of your “Step 2” Tinkercad simulation result below, show clearly the layout of your breadboard and the reading resistance on multimeter.

Q4: Include your Tinkercad simulation link of the circuit used in “Step 2”.

**Tinkercad Simulation Link**

|  |  |
| --- | --- |
| **Task 1:** |  |

Q5: Based on the results you got above, compare the two measured *Req* values at Step 1 & 2. Are the two values the same?

Q6: Show your steps of obtaining *Req* = 3R.

**Task 2: Transistor Circuit [5 points]**

Q7: Write down the values of your R1 and R2.

R1=\_\_\_\_\_\_\_\_\_\_\_kΩ; R2=\_\_\_\_\_\_\_\_\_\_kΩ;

(Use your own student ID!!! Fail to do so will result in a zero mark in Task 2.)

Q8: Fill in the table with the measured value of Vout.

|  |  |  |  |
| --- | --- | --- | --- |
| Case | VA | VB | Vout |
| (a) | 0V | 0V |  |
| (b) | 0V | 5V |  |
| (c) | 5V | 0V |  |
| (d) | 5V | 5V |  |

Q9: Include **4** simulation screenshots of each case above. Each screenshot should show clearly the layout of your breadboard and the reading voltage of Vout on multimeter.

**Screenshot of Case (a)**

**Screenshot of Case (b)**

**Screenshot of Case (c)**

**Screenshot of Case (d)**

Q10: Include your Tinkercad simulation link below.

**Tinkercad Simulation Link**

|  |  |
| --- | --- |
| **Task 2:** |  |

Q11: Translate the obtained voltage table in Q8 to a binary truth table, i.e. consider high value 5V as binary “1” and low value around 0 as binary “0”. Complete the truth table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Case | VA | VB | Vout |
| (a) | 0 | 0 |  |
| (b) | 0 | 1 |  |
| (c) | 1 | 0 |  |
| (d) | 1 | 1 |  |

Q12: From all the logic gates you learnt in Lecture 11, which one is implemented by this transistor circuit?

(1) indicate it’s name;

(2) indicate it’s logic output expression with the two inputs A, B;

(3) draw its’ logic gate symbol.

**Task 3: Digital Dice Decoder [7 points]**

Q13: Complete the truth table below.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| B2 | B1 | B0 | **“Red”** |  | B2 | B1 | B0 | **“Yellow”** |
| 0 | 0 | 0 |  |  | 0 | 0 | 0 |  |
| 0 | 0 | 1 |  |  | 0 | 0 | 1 |  |
| 0 | 1 | 0 |  |  | 0 | 1 | 0 |  |
| 0 | 1 | 1 |  |  | 0 | 1 | 1 |  |
| 1 | 0 | 0 |  |  | 1 | 0 | 0 |  |
| 1 | 0 | 1 |  |  | 1 | 0 | 1 |  |
| 1 | 1 | 0 |  |  | 1 | 1 | 0 |  |
| 1 | 1 | 1 |  |  | 1 | 1 | 1 |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| B2 | B1 | B0 | **“Blue”** |  | B2 | B1 | B0 | **“Green”** |
| 0 | 0 | 0 |  |  | 0 | 0 | 0 |  |
| 0 | 0 | 1 |  |  | 0 | 0 | 1 |  |
| 0 | 1 | 0 |  |  | 0 | 1 | 0 |  |
| 0 | 1 | 1 |  |  | 0 | 1 | 1 |  |
| 1 | 0 | 0 |  |  | 1 | 0 | 0 |  |
| 1 | 0 | 1 |  |  | 1 | 0 | 1 |  |
| 1 | 1 | 0 |  |  | 1 | 1 | 0 |  |
| 1 | 1 | 1 |  |  | 1 | 1 | 1 |  |

Q14: K-map & logic expression for each of the fours base patterns above (“Red”, “Yellow”, “Blue” and “Green”).

Q15: logic gates implementation diagram of each of the four patterns.

**Logic Implementation of “Red”**

**Logic Implementation of “Yellow”**

**Logic Implementation of “Blue”**

**Logic Implementation of “Green”**

Q16: Include your Tinkercad simulation link confirmed in Step 5.

**Tinkercad Simulation Link**

|  |  |
| --- | --- |
| **Task 3:** |  |

Q17: Write down the value of your Dice Face number “y” and your input B2B1B0.

y = mod (x, 6) +1 =\_\_\_\_\_\_\_\_\_\_\_; B2B1B0 =\_\_\_\_\_\_\_\_\_\_\_;

(Use your own student ID!!! Fail to do so will result in a zero mark in Task 3.)

Q18: Include the simulation screenshot of your Dice Face number “y” displayed by the LED lights. Show clearly the layout of the circuit on your breadboard: including LED lights and DIP Switch ON/OFF setting.

**Screenshot: Dice Face of number “y”**