

ECE 476/676 - Homework #2

Loops, Subroutines, Loops, Binary Outputs

Loops in Python

1) A and B are playing a dice game.

- Player A rolls three 12-sided dice and takes the sum (3d12)
- Player B rolls four 8-sided dice and takes the sum (4d8)

Whoever has the higher total wins. Player A wins on ties.

Determine the odds that player A will win a given game using a Monte-Carlo simulation of 10,000 games.

Some sample Python code for rolling dice:

```
from random import randint
d8 = randint(1,8)
d12 = randint(1,12)
```

2) Instead of playing a single game, player A and B play a 5-game match.

- Five games are played as per problem #1
- Whoever wins the most number of games wins the match.

Determine the odds that player A will win the match given this format using a Monte-Carlo simulation of 10,000 games.

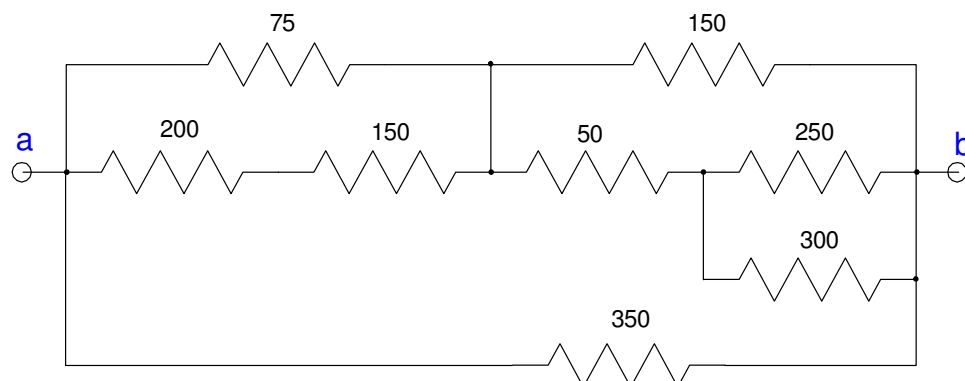
3) Instead of playing a best-of-5 match, player A and B play a first-to-5 games, win-by-2 match

- The match keeps going until one player has won five games.
- If neither player is up by two games at that point, the match keeps going until someone is up by two games.

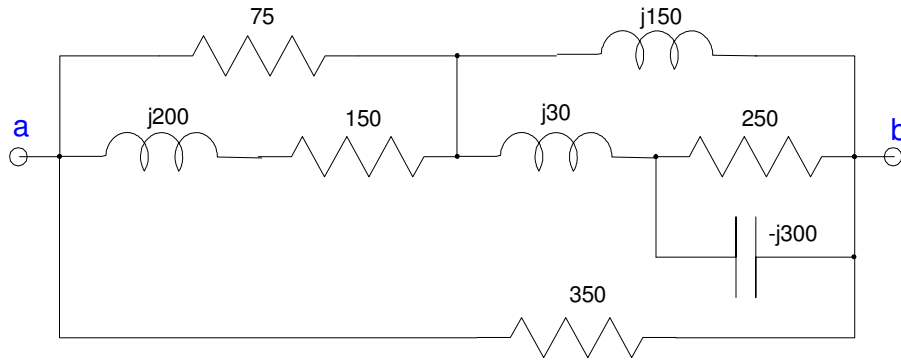
Determine the odds that player A will win the match given this format using a Monte-Carlo simulation of 10,000 games.

Python Subroutines

4) Using Python subroutines, determine the resistance Rab



5) Using Python subroutines, determine the resistance Z_{ab}



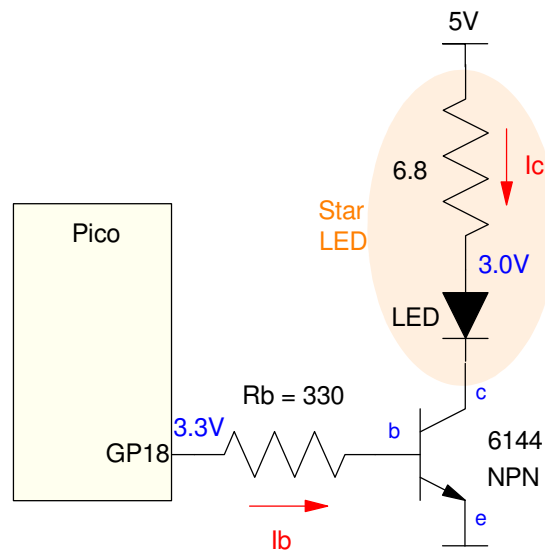
Binary Outputs

6) Write a Python program which turns on three LEDs sequentially:

- GP16 (on-board LED) for one second, then
- GP17 (on-board LED) for one second, then
- GP18 (external 1W LED) for one second, then
- repeat

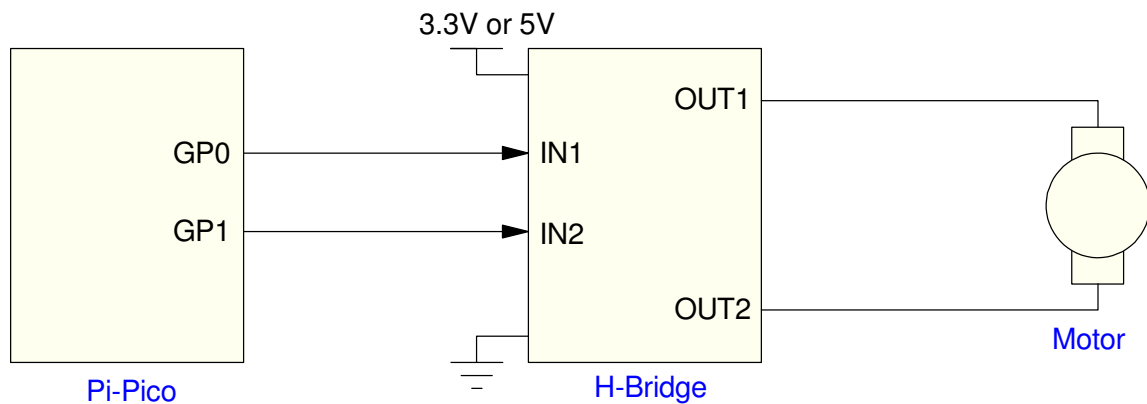
Measure the following for the 1W LED when turned on:

- The voltage out of the Pico microcontroller
- The voltage across the 1W LED and
- The voltage V_{ce} across the 6144 NPN transistor



Problem #6

- 7) Write a python program to drive an H-bridge tied to your DC motor. The motor should
- Spin clockwise for one second, then
 - Stop for one second, then
 - Spin in counter clockwise for one second, then
 - Stops for one second,
 - Then repeats
- 8) Measure the votlages when the motor is spinning clockwise, stopped, and counter-clockwise
- The voltage out of the Pico microcontroller
 - The votlage across the motor



Problem 7 & 8

- 9) Demonstrate either the LED or the motor problem
- in-person or attach a short video showing the lights or motor