

ME218a Final Exam

Due by 4:30pm on 12/09/98

Name: _____

**I Certify that I have taken this examination in compliance with the
Stanford University Honor Code.**

Signature

This is the Cover Sheet for your Solution !

#1_____

#2_____

#3_____

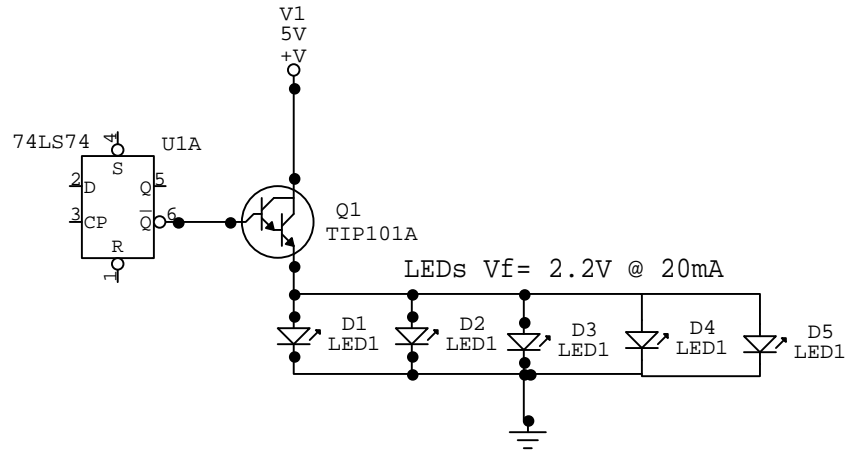
#4_____

#5_____

#6_____

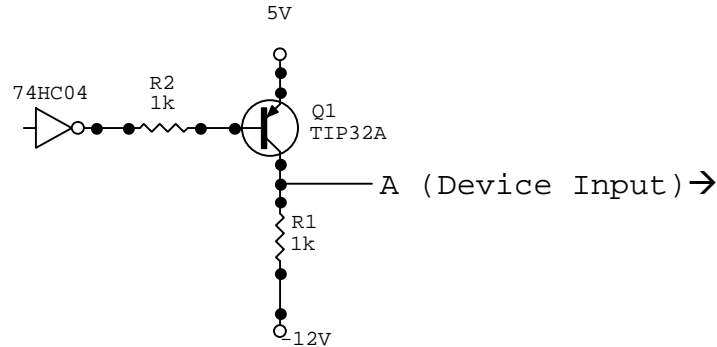
#7_____

Total_____

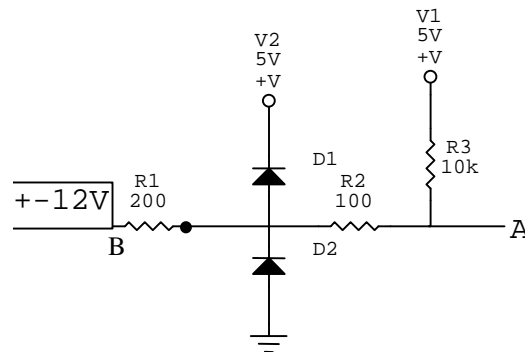
Problem 1 (15pts)

In the circuit above, assume that the inputs to the 74LS74 are tied to signals, so that the Q output is at a logical low.

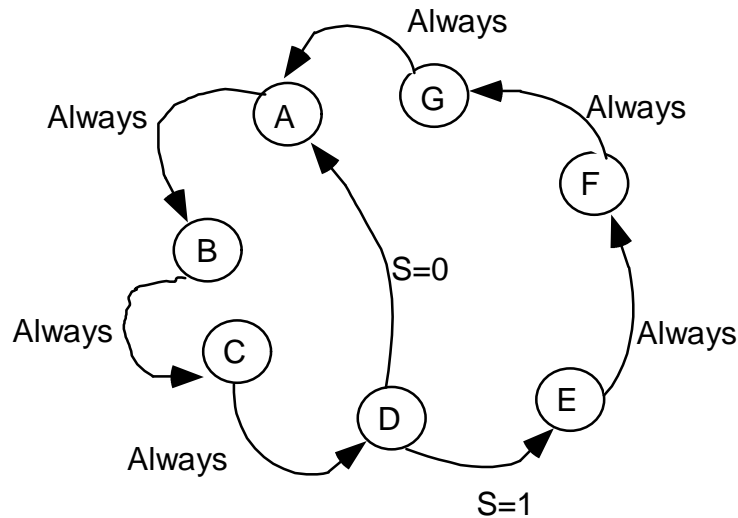
- Name three things wrong with the circuit shown above.
- How would you change this circuit to make it function properly ?

Problem 2 (20pts)

- What is the voltage at point A when the 74HC04 output is a logical high ?
- What is the voltage at point A when the 74HC04 output is a logical low ?
- How would the answer in part a change if the input resistance of the device connected at point A was $1k\Omega$?
- How would the answer in part b change if the input resistance of the device connected at point A was $10k\Omega$?

Problem 3 (15pts)

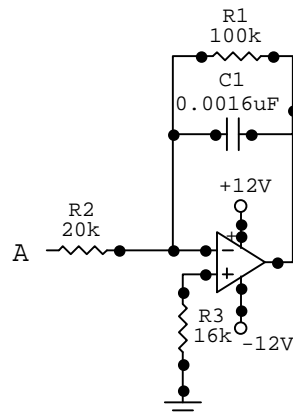
- In the circuit above, what is the voltage at point A when the input (B) is at +12V ?
- What is the voltage at point A when the input (B) is at -12V ?
- How would the voltage at B change if the output resistance of the -12V source was 200Ω ?

Problem 4 (15pts)

Given a logic input, S, and a clock, design a circuit to implement this state machine. Minimize the logic required. Use real parts and label them.

Problem 5 (5pts)

What would you need to add to the circuit in problem 4 to produce an output that toggled every time the state machine entered state A?

Problem 6 (15pts)

In the circuit above, the signal applied at point A is a 0.5V Peak-Peak sine wave centered about ground.

- What is the amplitude of the output if the input frequency is 100Hz ?
- What is the amplitude of the output if the input frequency is 1kHz ?
- What is the amplitude of the output if the input frequency is 10kHz ?
- What is the input resistance presented by this circuit to the source at point A ?
- What is the purpose of R3 ?

Problem 7 (15pts)

Design a circuit that will light an LED ($V_f = 1.7V$ @ 2mA) when an input voltage is between 1V and 2V.