

EE 4980

Spring 2021

Test 1

Open Everything
No collaboration

Process:

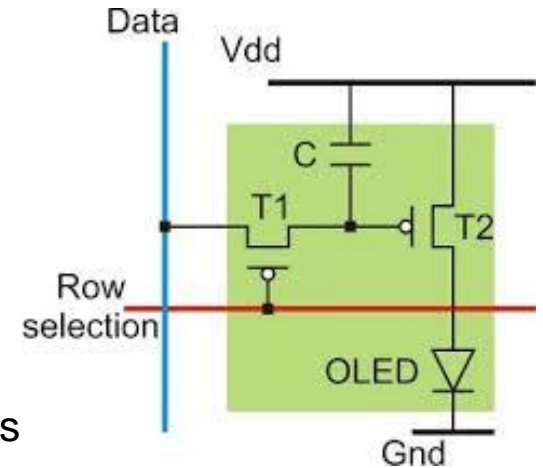
The test will be posted at 11:00 AM on the test day on the HW web page
Solutions are due 60 minutes later in OneNote inside the Tests tab

I will be available via MS-Teams or email if you have questions or internet issues

Display Technology – implementation

Assuming: $V_{dd} = 3V$, the current in T2 is proportional to its V_{gs} , and a $10pF$ pixel capacitance:

a) Calculate the voltage on the bottom terminal of the capacitor required to illuminate the LED at 30% of its max 5pts



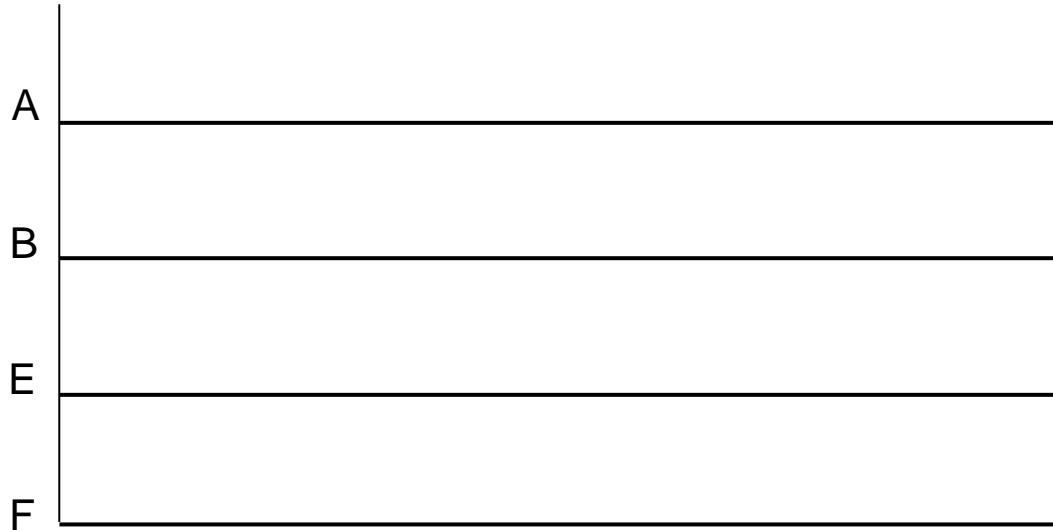
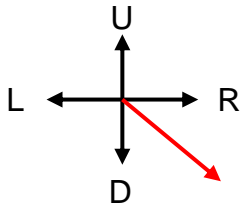
a) Draw the waveform for the Row and Data signals required to program the pixel from part a. Be sure to label the voltage levels and indicate where on the waveform programming is happening 5pts



The quadrature signals from a mechanical mouse are setup as follows:

L/R R – A leads B L – B leads A
U/D U – E leads F D – F leads E

Draw the 4 signals associated with travel in the direction indicated in red 5 pts



Given an optical mouse system with the following specifications

20x20 pixel array, pixel size of 100u in x 100u in, 20ips motion support

If the minimum pixel correlation required could be changed from 10x10 to 5x5
what would the new IPS specification become 5 pts

Identify the 3 types of power consumed in a digital CMOS system and provide a short description of each

10pts

a) -

b) -

c) -

CMOS Circuits

a) Which of the following is an approximate number of times a human touches a 14nm CMOS wafer throughout the manufacturing process (circle) 2pts

5

50

500

b) Given a 4.5in diameter CMOS wafer and a 0.5in x 0.4in die, which of the following is likely to be the correct number of die built on each wafer (circle)

5 pts

69

79

89

c) Which of the following impact parametric yield (circle)

3 pts

A wafer dropped in factory

B defects on the die

C slow transistors

D missing bond wires

Draw a simple schematic for each **bit cell** and describe **why** each cell is static or dynamic. 10pts

A) SRAM

B) DRAM

C) FLASH

Memory Capacity.

A) Describe the difference between a 16GBx4 DRAM and a 16GB, x4 DRAM 4 pts

B) I bought a 16GB flash drive at Best Buy. When I plugged it into my laptop it indicated that I only had 14.7GB of space remaining. There was nothing on the drive – explain 6 pts

Memory Architecture

10 pts

You are given a mystery SRAM part. It has a total of 17 address pins (excluding RAS and CAS) and you are told 3 of those are labeled as bank selection pins. The output is 8 bits wide. What is the largest size this memory could be (in bits)?

HDDs

10pts

Identify the timing components associated with a read

Why do HDDs need to use RLL codes?

Identify 2 ways to ensure no one can ever recover the data on an HDD disk

Optical Drives

10pts

Briefly describe the physical process used in each case to **Write** the disk.

Manufactured Audio CD

DVD-R disk

CD-RW disk

How do pits and lands interact with the laser on a CD to read 1's and 0's

Open

10 pts

Several of the systems we discuss do not have clock signals passed between blocks or available as part of the signal. What is the name of the process used to synchronize the incoming signals?

Briefly describe how this process works

How can we ensure the signal will work properly in this system?