## EE 5621 QUIZ 5 S. G. Burns

 **10 November 2021**

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

FET Pot-Pourri (12 Points each +4 Points for your name on any sheets you are sending me)

1. If the substrate doping is NA = 2 x 1017 cm-3 the **inverted** channel charge carriers are (**HOLES, ELECTRONS, BOTH HOLES AND ELECTRONS, NEUTRONS, PHOTONS**) and if the substrate doping is changed to be ND = 2 x 1017 cm-3, the **inverted** channel charge carriers are (**HOLES, ELECTRONS, BOTH HOLES AND ELECTRONS, NEUTRONS, PHOTONS**)
2. Current technology for “L” is (**FEW Å, 5-10 nm, 1 m, 5-10 m**) and for tox (**FEW Å, 5-10 nm, 1 m, 5-10 m)**
3. The guard ring doping density is (**HIGHER, ABOUT THE SAME, LOWER**) than the surrounding doped Si resulting in a (**HIGHER, ABOUT THE SAME, LOWER**) VT.
4. LOCOS is used to obtain a field SiO2 which is (**Thinner, About the Same, Thicker**) compared to the gate oxide resulting in a (**HIGHER, ABOUT THE SAME, LOWER**) VT.
5. The active region in a TFT is typically fabricated using **(X-Si, Poly-Si, a-Si, a-Si:H**) and the resultant material (mobility) is (**HIGHER, ABOUT THE SAME, LOWER**) compared to what is expected from a non-TFT MOSFET.
6. A student, enrolled in a course similar to our EE 5621 in a large university located in the Twin Cities, suggests that the guard band doping should be 2 x 1023 cm-3 of As in an NMOS. Provide two reasons why this student will probably get a very low grade in their semiconductor course.
7. An iPhone 13 has a 2532 x 1170 RGB OLED display. The display would be described as (**Emissive, AMLCD, LCD**) with an aspect ratio of \_\_\_\_\_\_\_\_\_\_\_ and the display is fabricated using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ individual OLEDs.
8. Assume an NMOS has a threshold voltage VT = 2 volts. Fill in the following table for the regions of operation.

|  |  |  |
| --- | --- | --- |
| VGS | VDS | Region of Operation |
| 1.0 | 5 |  |
| 3..0 | 5 |  |
| 8.0 | 5 |  |