

ECEN302 : Integrated Digital Electronics

Assignment 2 Submission

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October 13, 2020

1. *List three advantages of scaling down the feature sizes of silicon devices.*

- Higher density means more transistors on a single device
- Smaller distance means faster propagation time and lower power loss.
- Smaller sized dies can be run faster and cooler

2. *List two consequences of scaling down the feature sizes of silicon devices.*

- As feature sizes decrease the sum effect of slow atomic diffusion through the semiconductor material decrease the time until the device is unusable.
- At smaller and smaller "trace" sizes the risk/probability of electrons quantum tunnelling becomes significant.

3. *Briefly discuss and compare the performance and typical uses of microprocessors and FPGAs.*

The basic differentiation between the devices is

4. *List four advantages of integrating a microprocessor and an FPGA onto a single chip.*

- Able deploy a more traditional sequential CPU based workload that can make use of parallel hardware accelerated processing.
- Same die mean higher bandwidth communication between the two devices.
- More efficient power usage due to single die.
- Reduce requirement of auxiliary interfacing components.

5. *Provide one application or product example that benefits from having both a microprocessor and a FPGA.*

High speed portable digital oscilloscope, such as the DS213. This used a ARM cortex m3 for the general purpose processing and operation and an FPGA to manage/drive the large amount of data from the inputs ADCs.

6. *In a RF receiver signal chain, why is it advantageous to have the ADC as close as possible to the Antenna?*

Reduce analog signal line length as much as possible to reduce interference from noise and reactive coupling, as to digital output signals are much harder to corrupt.

7. *Describe the operation of the OSERDES and ISERDES FPGA I/O blocks.*

8. *Describe, with the aid of diagrams, how you would connect the AD9739 DAC to a Xilinx 7 series device and run the DAC at 2GSPS (note: you do not need to create a detailed schematic diagram).*