



Assignment no 07:

Chapter 5: Digital Building Blocks

Note: You can check the exercises after the Chapter. In our assignment, we are using the 2nd Edition of “Digital Design and Computer Architecture” By David and Sarah Harris.

Exercise 5.25 Express the following base 10 numbers in 16-bit fixed-point sign/ magnitude format with eight integer bits and eight fraction bits. Express your answer in hexadecimal.

(a) -13.5625 (b) 42.3125

Exercise 5.27 Express the base 10 numbers in Exercise 5.25 in 16-bit fixed-point two’s complement format with eight integer bits and eight fraction bits. Express your answer in hexadecimal.

Exercise 5.29 Express the base 10 numbers in Exercise 5.25 in IEEE 754 single-precision floating-point format. Express your answer in hexadecimal.

Exercise 5.34 Add the following IEEE 754 single-precision floating-point numbers.
 $C0123456 + 81C564B7$

Exercise 5.43 Build a 32-bit synchronous Up/Down counter. The inputs are Reset and Up. When Reset is 1, the outputs are all 0. Otherwise, when $Up = 1$, the circuit counts up, and when $Up = 0$, the circuit counts down.

Exercise 5.49 Flash EEPROM, simply called Flash memory, is a fairly recent invention that has revolutionized consumer electronics. Research and explain how Flash memory works. Use a diagram illustrating the floating gate. **Describe** how a bit in the memory is programmed. Properly cite your sources.

Exercise 5.50 (b) The extraterrestrial life project team has just discovered aliens living on the bottom of Mono Lake. They need to construct a circuit to classify the aliens by potential planet of origin based on measured features available from the NASA probe: greenness, brownness, sliminess, and ugliness. Careful consultation with xenobiologists leads to the following conclusions:

- If the alien is green and slimy or ugly, brown, and slimy, it might be from Mars.
- If the critter is ugly, brown, and slimy, or green and neither ugly nor slimy, it might be from Venus.
- If the beastie is brown and neither ugly nor slimy or is green and slimy, it might be from Jupiter.

Note that this is an inexact science; for example, a life form which is mottled green and brown and is slimy but not ugly might be from either Mars or Jupiter.

Program a 16×3 ROM to identify the alien. You may use dot notation.