

American University of Beirut

Faculty of Engineering and Architecture

Department of Electrical and Computer Engineering

EECE 200-Introduction to Engineering – Fall 2013

Homework 2

Problem 1 (IEEE and Ethics): [16 points]

Visit the website of Institute of Electrical and Electronics Engineers (IEEE) and answer that questions that follow:

<http://www.ieee.org/index.html>

- a. What is the mission and vision of IEEE? [2 points]
- b. How many regions does IEEE have? To which region does Lebanon section belong? [2 point]
- c. Name 3 societies of IEEE including their publications. [6 points]

Check IEEE code of ethics at the following website:

<http://www.ieee.org/portal/pages/iportals/aboutus/ethics/code.html>

- d. List 4 items from the code and give examples of how we can apply 2 of them to our real life. [6 points]

Problem 2 (Circuits and Electronics): [15 points]

- a. What is the main chip used in iPhone 5, name 2 other chips on this phone. [3points]

Intel recently released the 4th generation Intel® Core™ i3 processor. The chip has 1.4 billion transistors in 2013.

- b. Suppose that at some time in the future, Intel will release the chip with 16 billion transistors. In what year will this occur? [6points]
- c. Moore's Law says that the number of transistors doubles every two years, how many transistors would be on this chip in the year 2030? [6points]

Problem 3 (Computer Hardware): [16 points]

Consider the following expression:

$$O = [(X' + Y) \oplus (Z' + Y)] + [(Y \cdot Z) \oplus X]'$$

- Find the truth table of the following expression (output O in terms of three inputs X, Y, and Z). [10 points]
- Write the following expression in terms of AND, OR, NAND, NOR, NOT and XOR gates. [6points]

Problem 4 (Communications and Signals): [18 points]

The following audio signal $Y(t) = 2 \sin(3500t)$ Volts is to be transmitted via a communication link using digital communication system. (Indicate units whenever necessary).

- What are the two main steps in Analog to Digital conversion? [2 points]
- What is the minimum sampling rate required to sample this signal? Why? [1 point]
- If the signal is sampled at a rate of 1500 samples/sec. Find the values of the first five samples, starting with $t=0$. Show all your calculations. [5 points]

The samples are quantized to 128 discrete levels that correspond to full range of +/- 2Volts (All zeros is -2V and all ones is +2V).

- If 128 quantization levels are used, what is the required bits/sample of the A/D converter? [1 point]
- Find the binary representation of the first five samples starting at $t=0$. Show all your calculations. [5 points]
- Identify two ways for improving the quality of A/D conversion. What disadvantage does each way have? [4 points]

Problem 5 (Project Management): [35 points]

Consider the following list of activities for an engineering project along with the expected duration in days. The activities are shown in the table below:

Activity	Predecessor	Duration
A	None	10
B	A	5
C	A	15
D	A	5
E	B	20
F	B	15
G	C	10
H	D	5
I	F,G	10
J	E, I, H	5

- Show the network diagram representation of this project. [4 points]
- Identify the paths from start to end of the project and the duration of each path. [5 points]
- Find the earliest start and the earliest finish of each task. [7 points]
- Find the latest start and latest finish of each task. [7 points]
- Find the float time (slack time= $LS-ES=LF-EF$). [7 points]
- Indicate the critical path based on observations from part (b). Justify. [2points]
- Indicate the critical path based on observations from part (e). Justify. [2 points]
- Find the minimum project completion time. [1 point]