EECE 200 Homework (2)

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Exercise 1:

1. IEEE main mission is to encourage technological achievements and developments for the best of the humanity.

IEEE vision: it will play a big role in the world technical community and professional and will be worldwide known for participating in some technological projects as well as ameliorating some global conditions.

1. IEEE has more than 395000 members in 160 countries. It has almost 2000 student branches all over the world in 80 countries.
2. IEEE plays a role in advancing technology for humanity by encouraging projects and supporting them. It favors the share of ideas and new information and standards between its members all over the world and organizes regional and worldwide conferences for research and development. For example, the 2010 IEEE/ACM International Conference on Computer-Aided Design (ICCAD) covered CAD topics, including CAD for supporting post-complementary metal oxide semiconductor (CMOS) design. Moreover it publishes every new development and achievement like, for example, the IEEE Spectrum Magazine, a magazine that brings out every single new development.
3. From the IEEE code of ethics:
* To reject bribery in all its form.

For example, an engineer should refuse to do a harmful or illegal project even if he would receive certain bribery or a financial benefit.

* To seek, accept and offer honest criticism of technical work, to acknowledge and correct errors and to credit properly the contribution of others.

For example, an engineer who is responsible of a project has to accept critics as to ameliorate the effectiveness of his work and remove any fault. Moreover, if his assistant has discovered something very important during solving this project, he has to acclaim this and not being selfish so everyone would be encouraged to work more.

Exercise 2:

1. The two steps are sampling where we map signals to sample and then quantization where we map sample into bits.
2. W=3000rad/sec=2πF

Then f=477Hz

By Nyquist rule, sampling rate should at least twice the frequency of the signal so no data will be lost. Here the frequency of the signal is 477Hz. Hence, sampling rate is 1000 rate/sec so its frequency is 1000Hz.It is bigger than twice of this frequency. Thus, we can sample the signal at a sampling rate of 1000Hz/sec without losing any data and it can be transmitted normaly.

1. If the sampling rate is 20000samples/sec, then each sample will take 5\*10-4 sec.

For the first sample at t=0, y (0) =5cos (0) =5V

For the second sample at t=5\*10-4, y (5\*10-4) = 5cos (3000\*5\*10-4) =0.35V

For the third sample at t=10\*10-4, y (10\*10-4) = 5cos (3000\*10\*10-4) =-4.94V

For the forth sample at t=15\*10-4, y (15\*10-4) =5cos (3000\*15\*10-4) =-1V

For the fifth sample at t=20\*10-4, y (20\*10-4) =5cos (3000\*20\*10-4) =4.8V

1. If 256 quantization levels are used, the required bits/sample of the A/D converter is 8

2n=256

n= log 256/log2 = 8

1. As it is indicated in the directions, the samples are quantized to 256 discrete levels that correspond to full range of +/‐ 5 Volts (All zeros is ‐5V and all ones is +5V).Let’s take x=10/255

Then, v=-5+(a)x

The binary equivalent represents **a.** It represents the level of the sample.

Sample 1: -5 +(a)x=5 then a=255

255/2=127 r=1

127/2=63 r=1

63/2=31 r=1

31/2=15 r=1

15/2=7 r=1

7/2=3 r=1

3/2=1 r=1

**Then** **it is represented by 11111111**

Sample 2: -5+(a)x=0.35 then a=136

136/2= 68 r=0

68/2=34 r=0

34/2=17 r=0

17/2=8 r=1

8/2=4 r=0

4/2=2 r=0

2/2=1 r=0

½=0 r =1

**then its binary representation is 10001000**

Sample3: -5 +(a)x=-4.94 then a≈1

**Then its binary representation is 00000001**

Sample4: -5+(a)x=-1 then a=101

101/2=50 r=0

50/2=25 r=0

25/2=12 r=1

12/2=6 r=0

6/2=3 r=0

3/2=1 r=1

1/2=0 r=1

**Then its binary representation is 01100101**

Sample5: -5+ax=4.8 then a≈250

250/2=125 r=0

125/2=62 r=1

62/2=31 r=0

31/2=15 r=1

15/2=7 r=1

7/2=3 r=1

3/2=1 r=1

1/2=0 r=1

**Then its binary representation is 11111010**

1. To improve the quality of the A/D Conversion, we can increase the number of samples per second (sampling rate) making it more precise. This will need more numbers of bits thus a bigger memory which will make the conversion go slower.

We can also reduce the number of samples per second (sampling rate) using less memory so making the conversion faster. However, this conversion will be imprecise and we may lose some information.

Exercise 3:

1.

|  |  |  |  |
| --- | --- | --- | --- |
| X | Y | Z | O |
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 |

b-

X

Y

Z

Exercise 4:

**N 6**

**M 5**

**L 8**

**K 6**

**I 10**

**J 5**

**H 3**

**G 5**

**F 4**

**E 8**

**B 9**

**C 7**

**D 5**

**A 7**

Start

Finish

1. Paths: N-I-K-M : 27Days

 A-D-F-J-L-M: 34 Days

 A-D-I-K-M: 33 Days

 A-D-F-J-M: 26 Days

 A-B-J-M: 26 Days

 A-B-J-L-M: 34 Days

 A-C-E-H: 25 Days

 A-C-E-G: 27Days

 A-B-E-G: 29Days

 A-B-E-H: 27Days

1. A : ES= 0 EF= 7

N: ES= 0 EF= 6

B: ES= 7 EF= 16

C: ES= 7 EF= 14

D: ES= 7 EF= 12

E: ES= 16 EF= 24

F: ES= 12 EF= 16

G: ES= 24 EF= 29

H: ES= 24 EF=27

I: ES= 12 EF= 22

J: ES= 16 EF=22

K: ES= 22 EF=28

L: ES= 22 EF= 30

M: ES= 30 EF= 35

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ES | EF | LS | LF | Slack Time= LS-ES=LF-EF |
| A | 0 | 7 | 0 | 7 | 0 |
| B | 7 | 16 | 12 | 21 | 5 |
| C | 7 | 14 | 14 | 21 | 7 |
| D | 7 | 12 | 7 | 12 | 0 |
| E | 16 | 24 | 21 | 29 | 5 |
| F | 12 | 16 | 12 | 16 | 0 |
| G | 24 | 29 | 29 | 34 | 5 |
| H | 24 | 27 | 31 | 34 | 7 |
| I | 12 | 22 | 13 | 23 | 1 |
| J | 16 | 21 | 16 | 22 | 0 |
| K | 22 | 28 | 23 | 29 | 1 |
| L | 21 | 29 | 21 | 29 | 0 |
| M | 29 | 34 | 29 | 34 | 0 |
| N | 0 | 6 | 7 | 13 | 7 |

1. The critical path is the longest path of activities to the end of the project.

According to b), there are 2 critical path A-B-J-L-M and A-D-F-J-L-M with a duration of 34 days. However, the second one has the longest chain of activities. Thus A-D-F-J-L-M

 Is the critical path.

1. The activities on the Critical Path are the activities with slack time equal to 0. In this project the critical activities are: A,D,F,J,L,M. Then the critical paths is A-D-F-J-L-M.
2. The minimum duration is equal to 34 days.

Exercise 5:

1. Complementary metal–oxide–semiconductor (CMOS) is a technological device that plays an important role in constructing [integrated circuits](http://en.wikipedia.org/wiki/Integrated_circuit). CMOS technology is used in [microprocessors](http://en.wikipedia.org/wiki/Microprocessor), [microcontrollers](http://en.wikipedia.org/wiki/Microcontroller), [static RAM](http://en.wikipedia.org/wiki/Static_Random_Access_Memory), and other [digital logic](http://en.wikipedia.org/wiki/Digital_logic) circuits. This technology is also implanted in analog circuits such as [image sensors](http://en.wikipedia.org/wiki/Image_sensor), [data converters](http://en.wikipedia.org/wiki/Data_conversion) and many other devices... [Frank Wanlass](http://en.wikipedia.org/wiki/Frank_Wanlass) created and patented CMOS in 1967.

Reference: http://en.wikipedia.org/wiki/CMOS

BJT stands for bipolar junction transistor. It’s an electronically device with 3 terminals constructed of semiconductor material and may be used in [amplifying](http://en.wikipedia.org/wiki/Electronic_amplifier) or switching applications.

Reference: http://en.wikipedia.org/wiki/Bipolar\_junction\_transistor

The metal-oxide-semiconductor field-effect (MOSFET) conductor is used for amplifying or switching electronic signals. It has been introduced Julius Edgard Lilienfeld in 1925. In this device, a voltage created on the electrode a conductor channel between the drain and the source (the two other contacts). It is a transistor used a lot in digital and analog circuits.

Reference: http://en.wikipedia.org/wiki/MOSFET

1. We know that in 2005, the Pentium chip has 25 million transistors .By Moore’s Law, the number of transistors will double every two years.

Then, to find the year 2005+2n in which we will reach the 1.6billions f transistors, we’ll do: 1.6\*109=25000000\*2n

 2n=64

 n=lo64/log2=6

This will occur in 2017.

1. If the Moore’s Law says that the number of transistor will triple every 2 years then we will have in 2040k transistors:

2040 -2005- 2n=0 than n=17.5

k=25000000\*3n=5.6\*1015 transistors