

Homework 2- Solution EECE 200

Fall 2010-2011

Problem 1: (Total 20pts)

- a. **Mission statement:** "IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity". (2pts)

Vision statement: "IEEE will be essential to the global technical community and to technical professionals everywhere, and be universally recognized for the contributions of technology and of technical professionals in improving global conditions". (2pts)

IEEE promotes the engineering process of creating, developing, integrating, sharing, and applying knowledge about electro and information technologies and sciences for the benefit of humanity and of the profession.

- b. There are 2,000 student branches in 80 countries. (6pts)
- c. IEEE creates an environment where members collaborate on world-changing technologies – from computing and sustainable energy systems, to aerospace, communications, robotics, healthcare, and more.

Technology is constantly evolving. In order to quickly respond to new innovations, IEEE has a variety of technical committees and activities.

Industry professionals and their employers will value IEEE as a major resource to achieve success. (2pts for explanation) (2pts for examples)

- d. To reject bribery in all its forms; (6 pts: 3pts for each correct answer):

To accept responsibility in making decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;

Or other...

Problem 2: (Total 15pts)

- a. The two main steps are sampling and quantization (total: 1 0.5 for each answer)
- b. Undersampling. Nyquist rate. (1 point)
- c. The frequency of sampling is 2000 samples/sec. (total: 5 1 for each answer)

$$T_s = 1/f_s = 1/2000 \text{ sec/sample.}$$

$$t_1 = 0s : y(0) = 5\cos(0) = 5 \text{ Volts.}$$

$$t_2 = 1/2000s : y(t_2) = 5\cos(3/2) = 0.3537 \text{ Volts (3/2 in rad).}$$

$t_3 = 2/2000s : y(t_3) = 5\cos(6/2) = -4.9500$ Volts.

$t_4 = 3/2000s : y(t_4) = 5\cos(9/2) = -1.0540$ volts.

$t_5 = 4/2000s : y(t_5) = 5\cos(6) = 4.8009$ volts.

d. 8 bits/sample (1 pt)

e. (total: 5 1 for each correct)

T(ms)	Value of the sample(V)	Corresponding Level	Binary Representation of the level
0	5	255 th	255=11111111
1/2000	0.3537	136 th or 137 th	136= 10001000
2/2000	-4.9500	1 st	1=00000001
3/2000	-1.0540	101 th	101=01100101
4/2000	4.8009	250 th	250= 11111010

f. (total: 2 1 for each correct answer)

To improve the quality of the A/D conversion, we can either:

-increase the sampling rate, which will give us a better quality of the digital signal but a larger size of the file (due to a larger number of samples with the same number of bits)

Or:

-increase the number of quantized levels, which will also make the file larger (due to an increase in the number of bits used to store the data digitally, while the number of samples remains the same).

An increase in the sampling rate means better

Problem 3: (Total 15pts)

a) (total: 10)

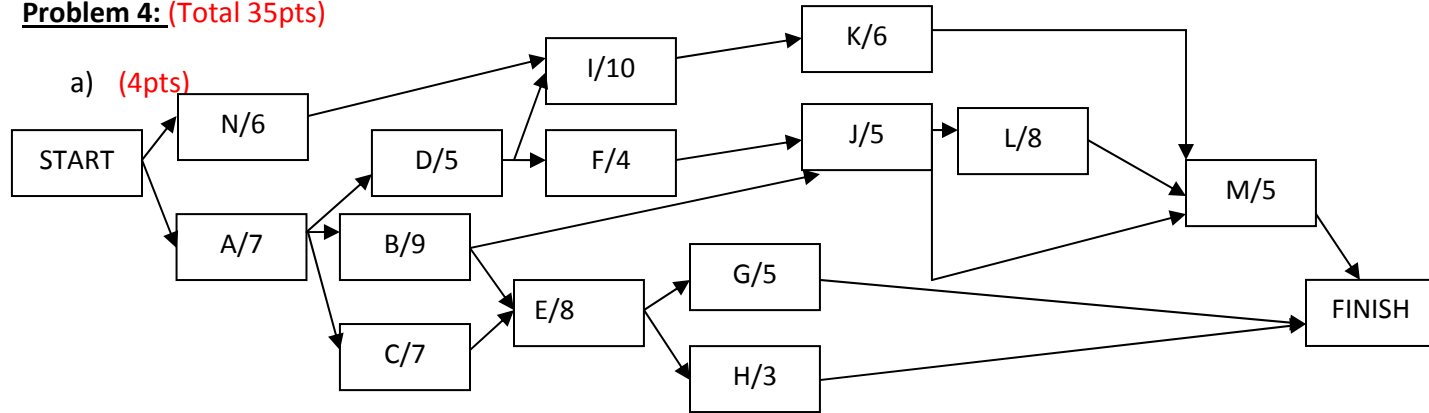
X	Y	Z	X.Y	(X.Y)xor Z	Z+Y	(Z+Y)'	(Z+Y)'+X	((X.Y)xor Z)+(Z+Y)'+X	O
0	0	0	0	0	0	1	1	1	0
0	0	1	0	1	1	0	0	1	0
0	1	0	0	0	1	0	0	0	1
1	0	0	0	0	0	1	1	1	0
1	1	0	1	1	1	0	1	1	0

0	1	1	0	1	1	0	0	1	0
1	0	1	0	1	1	0	1	1	0
1	1	1	1	0	1	0	1	1	0

b) (total: 5points)

$$O = \{[(X \text{ AND } Y) \text{ XOR } Z] \text{ NOR } [(Z \text{ NOR } Y) \text{ OR } X]\}$$

Problem 4: (Total 35pts)



b) (5pts)

Paths and duration:

- N-I-K-M= 6+10+6+5=27
- A-D-I-K-M=7+5+10+6+5=33
- A-D-F-J-L-M=7+5+4+5+8+5=34
- A-D-F-J-M=7+5+4+5+5=26
- A-B-J-M=7+9+5+5=26
- A-B-J-L-M=7+9+5+8+5=34
- A-B-E-G=7+9+8+5=29
- A-B-E-H=7+9+8+3=27
- A-C-E-G=7+7+8+5=27
- A-C-E-H=7+7+8+3=25

b) (7pts)

Task	Earliest Start	Earliest Finish
N	0	6
A	0	7

B	7	16
C	7	14
D	7	12
E	16	24
F	12	16
G	24	29
H	24	27
I	12	22
J	16	21
K	22	28
L	21	29
M	29	34

c) (7pts)

Task	Latest Start	Latest Finish
N	7	13
A	0	7
B	7	16
C	14	21
D	7	12
E	21	29
F	12	16
G	29	34
H	31	34

I	13	23
J	16	21
K	22	28
L	21	29
M	29	34

d) (7pts)

Task	Slack
N	7
A	0
B	0
C	7
D	0
E	5
F	0
G	5
H	7
I	1
J	0
K	0
L	0
M	0

f) A-D-F-J-L-M and A-B-J-L-M can both be considered as critical paths because they are the longest chain of activities (2pts)

g) Since the slack time of the activities A, B, D, F, J, L and M is equal to zero we can conclude that A-D-F-J-L-M and A-B-J-L-M are both critical paths (2pts)

h) Duration of critical Path= 34 (1pt)

Problem 5: (Total 15pts)

a. (5pts)

CMOS: Complementary metal–oxide–semiconductor (CMOS) (pronounced /'si:mɒs/) is a technology for constructing integrated circuits. CMOS technology is used in microprocessors, microcontrollers, static RAM, and other digital logic circuits.

BJT: A bipolar (junction) transistor (BJT) is a three-terminal electronic device constructed of doped semiconductor material and may be used in amplifying or switching applications.

MOSFET: The metal–oxide–semiconductor field-effect transistor (MOSFET, MOS-FET, or MOS FET) is a device used for amplifying or switching electronic signals.

b. (5pts)

The number of transistors in a chip in year Y2 is given by:

$N_2 = 2^{(Y_2 - Y_1)/2} * N_1$ where N_1 is the number of transistors in a chip in year Y1 ($Y_1 < Y_2$).

So $\ln(N_2) = (Y_2 - Y_1)/2 * \ln(2) + \ln(N_1)$

$Y_2 = 2 \ln(N_2/N_1) / \ln(2) + Y_1$

$Y_2 = 2 \ln(1600/25) / \ln(2) + 2005$

Y2=2017

c. (5pts)

We will have $3^{(n/2)} * 25 * 10^6$ transistors

Where $n=2040-2005$, hence we will have $5.59193309 * 10^{15}$ transistors on a single Pentium chip.