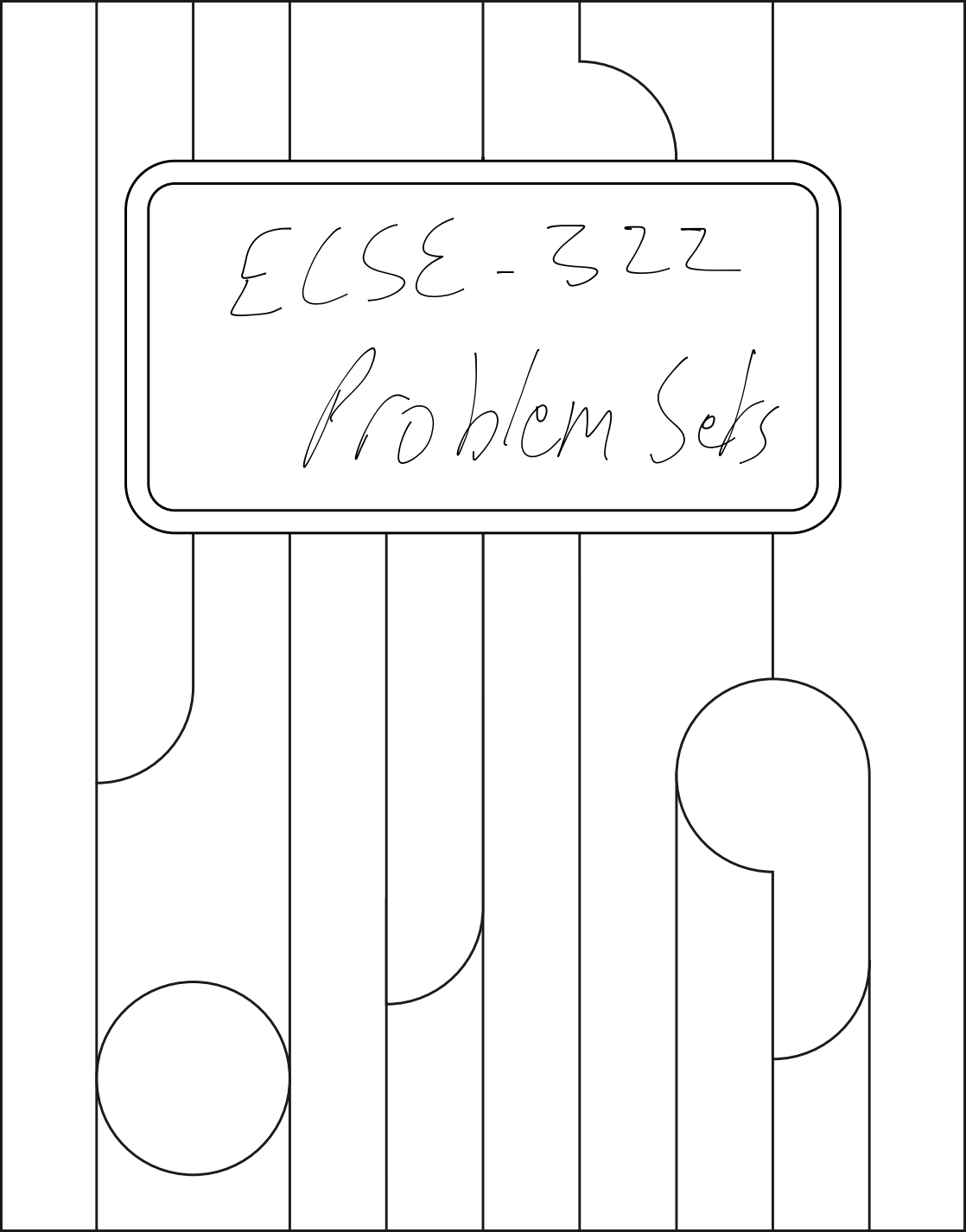

ECSE-322
Problem Sets

# Department of Electrical and Computer Engineering

# Course ECSE-322

# Computer Engineering

## Problem Set 1

## 12 September 2014

1. Name 5 components (capabilities) that should be present in any information processing system

2. In a simple communications system, describe how the reliable transmission of information can take place.

3. What is the difference between an “open-loop” and a “closed-loop” communications system?

4. Describe what is meant by a synchronous system and give an example of such a system that you use every day.

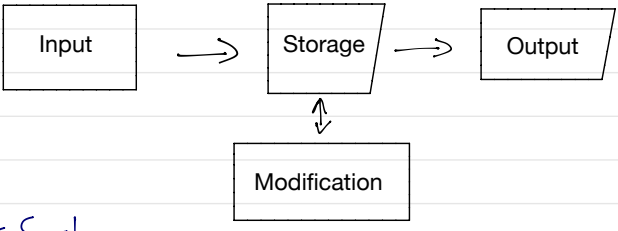
5. Explain why an asynchronous system is inherently slower than a synchronous system. What is meant by “overhead”?

# ECSE Tutorial 1

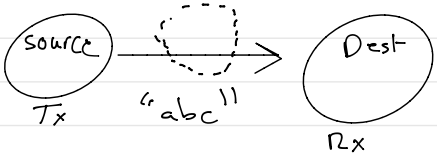
## Problem Set 1:

### 1) 5 components of Information System:

1) Input 2) Modification 3) Storage 4) Output 5) Transmission

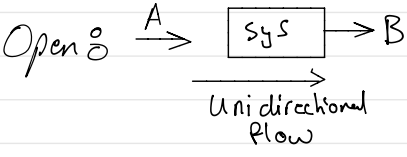


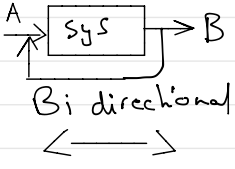

### 2) "Reliable" Trans- System




- identify $R_x$, $T_x$
- Encoding/protocol/language
- Analyze errors
- Channel
- Identifiers (Start, End)
- Speed
- Control

### 3) Difference Between an open loop and a closed loop communication system



4) Synchronous System

- "clock" - Time - Periodic Pattern

5) Explain why asynchronous system is slower? what is an overhead?

"Cause and Effect" "dependant, The time delay is the overhead.

# Department of Electrical and Computer Engineering
# McGill University

# ECSE-322
# Computer Engineering

# 15 September 2014

# Problem Set 2

1. Floating point representation:

(a) Show the IEEE-754 binary representation of the number –0.75 (i.e.- ¾ in base 10) using the single precision format.

(b) What floating point number (in IEEE-754 format) is represented by the following:
00110000001000000000000000000000

(c) Represent $0.125 \times 16^5$ and $-0.125 \times 16^{-5}$ in USASI.

(d) Identify how infinity, not a number, and 0 are represented in IEEE-754 and USASI.

2. Determine the maximum relative error and minimum and maximum values of a real number stored using the following floating point formats:

(a) IEEE 754,
(b) USASI.

We define the relative error in terms of the difference between the number and its representation as follows:

Let rep(n) be the representation of n.
The relative error is err(n) = |rep(n) – n| / |n|, where |n| represents the absolute value of n.

(Note: This question is intended to be particularly challenging.)

**Important fact for part (a):** Assume that the IEEE-754 imposes hidden bit normalization of the mantissa in all cases (FYI. There are cases where the hidden bit normalization is not invoked. These should be ignored for our purposes.)
**Important fact for part (b):** The first hexadecimal digit must be non-zero for any non-zero number in USASI.

3. Hashing:

Consider a list of words to be placed into an array of size M=11 using the following hash function:

h(x) = (sum of the ASCII decimal values of the first and last letters of the word) mod M

(a) Draw the resulting array (referred to as a hash table) after inserting, in order, the following words *ibex, hare, ape, bat, koala, mud, dog, carp, stork* if collisions are dealt with through linear (sequential) probes.

(b) How many collisions does this result in?

(c) Draw a picture of the resulting hash table that uses bucket hashing instead.

4. A problem commonly encountered with linear hashing at medium levels of occupancy is "clustering": data items tend to gather in clusters of consecutive locations in the hash table. Explain what causes the phenomenon of clustering, and which hashing functions are less likely to create clustering.