Sheet 4 - Sol

1.10

- **Image size in pixels**: \(1024 \times 1024 = 1 \text{ Mega Pixel}\)
- **Image size in bytes**: \(1 \times 3 = 3 \text{ MB}\)
- **Storage capacity in images**: \(256/3 \approx 85 \text{ Image}\)

1.12

a) Data retrieval from main memory is much faster than from disk storage.
   Data in main memory can be referenced in byte-sized units rather than in large blocks.

b) Disk storage systems have a larger capacity than main memory.
   The data stored on disk is less volatile than that stored in main memory.

1.15

- **Novel size in characters**: \(400 \times 3500 = 1400000 \text{ Character}\)
- **Novel size in bytes (ASCII)**: \(1400000 \times 1 = 1400000 \text{ Byte} \approx 1.4 \text{ Mega Byte}\)
- **Novel size in bytes (Unicode)**: \(1400000 \times 2 = 2800000 \text{ Byte} \approx 2.8 \text{ Mega Byte}\)

1.26

a) 15 b) 1 c) 21 d) 8 e) 19 f) 0

1.27

a) 111 b) 1011 c) 10000 d) 10001 e) 11111

1.34

a) \(3_{10} \) b) \(4_{16} \) c) \(13_{16} \) d) 1 e) \(2_{4} \)

1.35

a) 101.11 b) 1111.1111 c) 101.011 d) 1.01 e) 110.101

1.46

**Four-byte capacity cells:**

- Number of cells: \(4 / 4 = 1 \text{ Mega Cell} = 2^{20} \text{ Cell}\)
- Then the addresses range is \((0000 \ 0000 \ 0000 \ 0000 \ 0000 \ 0000 \ 0000 \ 0000)_{2} : (1111 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111)_{2}\)
- In hexadecimal \((000000)_{16} \text{ to } (FFFFF)_{16}\)
- Then the last memory address is \((FFFFF)_{16}\)

**One-byte capacity cells:**

- Number of cells: \(4 / 1 = 4 \text{ Mega Cell} = 2^{8} \times 2^{8} \text{ Cell} = 2^{22} \text{ Cell}\)
- Then the addresses range is \((00 \ 0000 \ 0000 \ 0000 \ 0000 \ 0000 \ 0000 \ 0000)_{2} : (11 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111 \ 1111)_{2}\)
- In hexadecimal \((000000)_{16} \text{ to } (3FFFF)_{16}\)
- Then the last memory address is \((3FFFF)_{16}\)

1.52

| 11001 | 11011 | 10110 | 00000 | 11111 | 10001 | 10101 | 00100 | 01110 |

1.54

a) HE
b) FED
c) DEAD
d) CABBAGE
e) CAFE
II Answer the following questions:

1.

\[
10+10.5+8-11.6-9\% 
\]

2.

\[
\begin{array}{cccccc}
& 1 & 1 & 1 & 1 & 1 \\
1 & 0 & 0 & + & 0 & 1 & 1 & 0 \\
1 & 1 & 0 & + & 0 & 1 & 1 & 0 \\
1 & 1 & 0 & + & 0 & 1 & 1 & 0 \\
1 & 1 & 0 & + & 0 & 1 & 1 & 0 \\
\end{array}
\]

3.

a)  \textit{RAM}  \\
Random Access Memory  \\
\{Computer’s Main Memory\}

b)  \textit{Mass Storage}  \\
Mass Storage (or Secondary Storage) refers to larger capacity and less volatile storage media based on different technologies like:

- \textit{Magnetic}  \\
Electric current is used to write/read to/from this disk or tape covered with magnetic coating.  \\
\{Magnetic Disk, Magnetic Tape\}

- \textit{Optical}  \\
Laser is used to write/read to/from reflective material covered with a clear protective coating.  \\
\{CD, DVD\}

- \textit{Flash Technology}  \\
Electronic signals are used to write/read to/from array of floating gate transistors.  \\
\{Flash Disk, SD Card\}

c)  \textit{Buffer}  \\
It is a storage area used to hold data on a temporary basis, usually during the process of being transferred from one device to another.  \\
\{Printer Buffer, Hard Disk Drive (HDD) Buffer\}

d)  \textit{ASCII}  \\
American Standard Code for Information Interchange  \\
It is a 7-bit binary code for representing 128 character of the English alphabet including a-z, A-Z, and 0-9.

\[
\begin{array}{c}
\ldots \ 010 \ 0100 \$ \\
\ldots \ 011 \ 0100 \ 4 \\
011 \ 0101 \ 5 \\
\ldots \ 100 \ 1101 \ M \\
100 \ 1110 \ N \\
\ldots \ 110 \ 1101 \ m \\
110 \ 1110 \ n \\
\ldots \\
\end{array}
\]