

Digital Logic Design

Assignment 01

Resources:

Video Lecture # 06: <https://www.youtube.com/watch?v=rb6vaNZflp8>

Video Lecture # 07: <https://www.youtube.com/watch?v=4COgD6DM9a8>

Problem 1: _____ [5]

Convert $41A7_{16}$ into their respective binary, decimal, and octal number, if this number is:

- 2's complement signed number
- 1's complement signed number
- unsigned number

Also, do show the conversion steps.

Problem 2: _____ [5]

Why do we need separate hardware for subtraction if using sign-magnitude encoding? And do we need separate hardware for subtraction if using 1's complement and 2's complement encoding, explain your answer in one paragraph.

Problem 3: _____ [5]

Write down a C/C++ program that checks the minimum and maximum value that can be stored in signed and unsigned data types like **char**, **short**, **int**, **long**, and **long long**. What happens when you try to store a value of 256 in a variable of **char** data type. Does this have something to do with the h/w and operating system (32 bit or 64 bit)?

Problem 4: _____ [5]

What will be the range of number having 16 bits, if it is a:

- 2's complement signed number
- 1's complement signed number
- unsigned number

Problem 5: _____ [5]

By adding the following 2's complement signed numbers, will overflow occur? If yes, then is it a positive overflow or a negative overflow? Also, give the status of Carry flag (CF) and Overflow flag (OF). Do show your work.

- $0x86 + 0x84$
- $0x7E + 0x70$
- $0xF6 + 0x7E$

Problem 6: _____ [5]

Write down short notes on three Binary codes and make their table showing conversions:

- Binary Coded Decimal(BCD)
- Excess-3
- Gray Code

Problem 7: _____ [10]

Write down short notes on three Alphanumeric codes:

- ASCII and Extend ASCII
- Unicode (UTF-8, UTF-16, UTF-32)
- EBCDIC
- Base-64 Encoding

Problem 8: _____ [10]

Differentiate between 7-bit and 8-bit ASCII. Write a one-page note on Unicode Standard. Mention some common encoding formats used by Unicode and there at least three implementations. Also tell what Unicode encoding format is used by Windows, Linux, and macOS.

Problem 9: _____ [10]

Mention the advantages and disadvantages of storing real numbers using Fixed Point Representation. Mention the range and precision of following encoding schemes for storing real numbers:

- a) 8 bits (with 1 bit for sign, 5 bits for integral part and 2 bits for fractional part)
- b) 8 bits (with 1 bit for sign, 2 bits for integral part and 5 bits for fractional part)

Which of the above two encoding scheme you will prefer to use in which scenario?

Problem 10: _____ [5]

What do you mean by floating point representation of real numbers. What is its advantage and disadvantage over fixed point representation? What was the problem that was handled by Institute of Electrical and Electronics Engineers by introducing the IEEE-754 standard for floating-point representation?

Problem 11: _____ [10]

Convert following decimal numbers to 32-bit IEEE-754 floating-point representation in Hex format. Show your conversion steps.

- a) 75.07539₁₀
- b) -128.25508₁₀

Problem 12: _____ [10]

Convert following 32-bit IEEE-754 floating-point representation of real numbers given in Hex format to their corresponding decimal representations. Show your conversion steps.

- a) 41440000₁₆
- b) 41A42B43₁₆

Problem 13: _____ [5]

Draw the floating-point representation of IEEE-754 standard having:

- a) 32 bits
- b) 64 bits
- c) 128 bits
- d) 256 bits

And a precision of how many decimal digits did they give depending on their mantissa?

Problem 14: _____ [5]

Why do IEEE-754 designers use biased exponent representation and not 2's complement representation to store the exponent and its sign?

Problem 15: _____ [5]

Why is the exponent placed before mantissa in the IEEE-754 standard?

Submission Instructions:

- **Solutions to all the parts must be your own hard work. DON'T let anyone copy your assignment. In case of a copy both students will be awarded a ZERO may be some negative marks as well.**
- **You have to submit your assignment in HANDwritten form on plain A4 Sheets.**
- **Attach a cover sheet showing the assignment title, course and your personal information.**



**TIME IS JUST LIKE MONEY.
THE LESS WE HAVE IT;
THE MORE WISELY WE SPEND IT.
Manage your time and Good Luck**