



SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION
(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Information Technology

First Year, First Semester Examination-2019

HNDIT 1104: Data Representation and Organization

Instructions for Candidates:

No. of. Questions: 05

Answer four (04) questions only

No. of. Pages : 04

(All the workouts should be shown in the answer scripts)

Time: (02) Two hours

Question 1

1. Compare and contrast non-positional (non-weighted) number systems and positional number systems (weighted) with suitable examples.

(4 Marks)

2. Write the expanded form (sum of products) for the following numbers. (Note: fully simplified answers are not required)

$$(a) 47_{10}$$

$$(b) 0.3351_8$$

$$(c) ABF_{16}$$

$$(d) 10001011_2$$

(1x4=4 Marks)

3. Perform the following binary arithmetic operations.

$$(a) 10011_2 + 1110_2$$

$$(b) 101.01_2 + 1011.01_2$$

$$(c) 11000_2 - 1111_2$$

$$(d) 1101_2 * 101_2$$

$$(e) 1001010_2 \div 1000_2$$

(1x5=5 Marks)

4. Convert the following decimal numbers into binary numbers.

$$(a) 139_{10}$$

$$(b) 22.246_{10}$$

$$(c) 0.625_{10}$$

(2x3=6 Marks)

5. Convert the following decimal numbers into octal numbers.

- (a) 175_{10}
- (b) 0.015625_{10}
- (c) 0.432_{10}

$(2 \times 3 = 6 \text{ Marks})$

(Total 25 marks)

Question 2

1. Briefly explain how the following approaches are used to represent signed binary numbers.

- (a) Signed Magnitude
- (b) Two's Complement

$(2 \times 2 = 4 \text{ Marks})$

2. Find the 8-bit sign magnitude for each of the following decimal numbers.

- (a) $(-23)_{10}$
- (b) 115_{10}

$(2 \times 2 = 4 \text{ Marks})$

3. (a) Find the range of integers which can be represented by using a N-bit two's complement.

(b) Find the largest positive number, which can be represented in 10-bit two's complement binary. Write your answer in binary and decimal formats.

$(2+3=5 \text{ Marks})$

4. Find the decimal equivalents of the following 8-bit two's complement binary numbers.

- (a) 11101100_2
- (b) 11001000_2
- (c) 01101111_2

$(2 \times 3 = 6 \text{ Marks})$

5. Perform the following decimal operations using 8-bit two's complement.

- (a) $29_{10} + 36_{10}$
- (b) $18_{10} - 19_{10}$
- (c) $26_{10} - 13_{10}$

$10111000\ 1001001$

$(2 \times 3 = 6 \text{ Marks})$

(Total 25 marks)

Question 3

1. Briefly compare and contrast the Analog data and Digital data with suitable examples. (4 Marks)
2. Convert the following hexadecimal numbers into binary format.
 - (a) ABC7₁₆
 - (b) A21₁₆

(2x2=4 Marks)

3. Perform the following operations by using one's complement arithmetic.

$\begin{array}{r} \text{a} \\ \text{b} \\ \text{c} \\ \text{d} \\ \text{e} \\ \text{f} \\ \text{g} \end{array}$	$\begin{array}{r} + \\ - \\ + \\ - \\ + \\ - \\ + \end{array}$	$\begin{array}{r} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{array}$
0	0	0001
0	0	0010
0	0	0011
0	1	0100
0	1	0101
0	1	0110
0	1	0111
1	0	1000
1	0	1001
1	0	1010
1	0	1011
1	1	1100
1	1	1101
1	1	1110
1	1	1111

(2+3=5 Marks)

4. Perform the following operations.

- (a) 162₈ + 537₈
- (b) 2BFC₁₆ + 54A7₁₆
- (c) 1010110₂ + 1111011₂ + 1011111₂

1	0	0	1	—	9
1	0	1	0	—	A
1	0	1	1	—	B
1	1	0	0	—	C
1	1	0	1	—	D
1	1	1	0	—	E
1	1	1	1	—	F

(2x3=6 Marks)

5. Which of the following 4-bit two's complement binary operations generate overflow, and justify your answers by comparing decimal values.

- (a) 0111₂ + 1111₂
- (b) 1110₂ + 1000₂

↑	2	1	0
0	0	0	—0
0	0	1	—1
0	1	0	—2
0	1	1	—3
1	0	0	—4
1	0	1	—5
1	1	0	—6
1	1	1	—7

(2x3=6 Marks)

(Total 25 marks)

Question 4

1. Briefly explain the form of scientific notation for floating point representations used in computers with suitable illustrations. (4 Marks)
2. Display decimal number 5.125₁₀ in IEEE 754 single precision (32 bit) floating point format.

(4 Marks)

3. Explain the **Unicode Encoding Standard** in brief.

(5 Marks)

4. Find the 3-characters, coded by the '**1000100 1010010 1001111**' 7-bit ASCII binary format. (**Hint:** ASCII value for character 'A' in 7-bit binary is: 1000001).

(6 Marks)

5. Convert the following IEEE 754 single precision (32- bit) floating point format into decimal format:

0	10000110	101010000000000000000000
---	----------	--------------------------

(6 Marks)

(Total 25 marks)

Question 5

1. Convert the following data units into bits. (**Note:** fully simplified answers are not required)

- (a) Nibble
- (b) 8 Bytes
- (c) 0.25 MB
- (d) 1000 GB

(1x4=4 Marks)

2. Find the equivalent decimal values for the following 4 -bit BCD (binary coded decimal) codes.

- (a) 1001111001
- (b) 1001101010110

(2x2=4 Marks)

3. Draw the following logic gates and provide Truth tables and Boolean expressions for each.

- (a) NOT
- (b) NAND
- (c) Exclusive OR

(4x3=12
Marks)

4. Draw the logic circuit diagram for the Boolean expression $A'B + (B+C)'$.

(5 Marks)

(Total 25 Marks)