Al-Isra University

Faculty of IT

Department of Computer Science

جامعة الإسراء

كلية تكنولوجيا المعلومات

قسم هندسة البرمجيات

Department:	Assignment:	Submission Deadline:
SE	**#3**	
Semester:	**Year**:	**Instructor**
Second	2023/2024	Dr. Dimah Fraihat
Course No.:	**Course Name:**	**Section:**
	Computer Design and Organisation	1
Student No.:	**Student Name:**	**Submission date:**
AD0039	**Feras Sameer Saleem**	24/05/2024

Question No.	Mark	
	Max	Score
1	**1**	
2	**1**	
3	**1**	
4	**1**	
5	**1**	
Total Mark	**5**	

Note: 1- Copy and paste are prohibited

Assignment Title: Arithmetic

Q1) find the result of

1) 1101 / 11

× 100·001   ← الناتج

11 | 1101

11

0001

00

0100

11

001

....

2) 1110 * 1011

1110 = 14

1011 = 11

14 * 11 = 154

154 = **10011010**

....

3) 1001- 1101

1001 = 9

1101= 13

➔ 13 – 9 = -4

➔ -4 = **-100**

$$\begin{array}{cccc} 0 & 10 & & \\ \cancel{1} & \cancel{0} & 0 & 1 \\ 1 & 1 & 0 & 1^{-} \\ \hline - & 1 & 0 & 0 \end{array}$$

....

4) 0101+1101

$$\begin{array}{ccccc} \boxed{1} & \boxed{1} & \boxed{1} & \boxed{1} & \\ & 0 & 1 & 0 & 1 \\ & 1 & 1 & 0 & 1^{+} \\ \hline 1 & 0 & 1 & 1 & 0 \end{array}$$

....

Q2) a) Illustrate the main ways that are used to represent negative numbers in the computer. Specify briefly the advantages and disadvantages of each representation form.

There are several ways to represent negative numbers in computers: sign-and-magnitude, one's complement, two's complement, and excess representation.

- Sign-and-magnitude uses the leftmost bit to indicate the sign, but it has ambiguity with two representations of zero and requires extra steps for arithmetic operations involving positive and negative numbers.
- One's complement represents negative numbers by inverting all the bits, but it still has two representations of zero and requires extra steps for arithmetic operations involving positive and negative numbers.
- Two's complement represents negative numbers by inverting all the bits and adding 1 to the LSB. It has a single representation of zero, simplifies arithmetic operations, and allows for efficient hardware implementation.
- Excess representation adds a fixed bias to the binary representation, simplifying arithmetic operations, but it may lead to confusion outside the range of the system.

Among these representations, two's complement is the most commonly used in modern computers due to its simplicity, efficient hardware implementation, and single representation of zero.