**CS101 Assignment 2 Solution Idea**

**Spring 2020**

**Question # 01** **10 marks**

**In CPU all the arithmetic operations are performed in binary numbers (0 and 1). Suppose you have a small CPU which is designed to perform all arithmetic operations using addition only. You will explain how the following operations will be solved out by the CPU.**

1. **Multiplication of 6 and 2**
2. **Addition of 7 and 3**
3. **Subtraction of 5 and 4**

Solution:

1. **Multiplication of 6 and 2**

6\*2=12

11110 (6)

110 (6)

1100 (12)

1. **Addition of 7 and 3**

111111 (7)

+11 (3)

1010 (10)

1. **Subtraction of 5 and 4**

5+(-4)

0101

1100 (2’s complement of 4)

0001

**Question # 02** **10 marks**

**You have an image that can be represented in 8 bits. The image is given below:**

**(00110011)2**

**You are required to send this image to someone but not in original form. So, nobody can extract the features from the image.**

**So, we will perform following two operations on the image.**

1. **Masking**

**You will apply an 8-bit (10101011)2 mask using AND logic operation.**

1. **Inversion**

**You will invert the masked image using XOR logic operation.**

Solution:

1. **Masking**

**You will apply an 8-bit (10101011)2 mask using AND logic operation.**

AND

(10101011)2

|  |  |  |
| --- | --- | --- |
| X | Y | output |

|  |  |  |
| --- | --- | --- |
| x | Y | output |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

(0010011)2  AND

(10101011)2

(00100011)2

1. **Inversion**

**You will invert the masked image using XOR logic operation.**

**XOR** (10101011)2

|  |  |  |
| --- | --- | --- |
| x | Y | output |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

(00110011)2

(0001000)2