Name: Id#

COE 202, Term 162

Fundamentals of Computer Engineering

Quiz# 4

 Date: Sunday, April 16

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**Q1.** In designing a combinational circuit that computes the function *f(X) =X2* – X for a 3-bit 2’s complement signed number *X,* ***where the output f(X) is an un-signed integer*:**

1. How many bits do we need for the output? [2 points]
2. Obtain the truth table for this circuit. [4 points]
3. Obtain simplified Boolean expressions of the circuit outputs in SOP form. [4 points]

**Q2.**

1. What is the **minimum** number of bits needed to represent integers in the range from –100 to +100 using sign-magnitude representation? [2 points]
2. Show the binary representations of **+49** and **–49** using **10-bits** signed-magnitude, 1’s complement and 2’s complement representations (record your answers in the table below). [4 points]

|  |  |  |  |
| --- | --- | --- | --- |
| Decimal | Binary Signed-magnitude representation | Binary Signed-1’s complement representation  | Binary Signed-2’s complement representation |
|  - 49 |  |  |  |
|  + 49 |  |  |  |

1. Perform the following operations on **6-bits** signed numbers **using 2’complement representation**. Check for overflow and mark clearly any overflow occurrences. [4 points]

|  |  |
| --- | --- |
| (1) 011100 – 011111 Overflow: Yes/No | (2) 101111 + 100110  Overflow: Yes/No |