

Name:

Id#

COE 202, Term 162
Fundamentals of Computer Engineering

Quiz# 4

Date: Sunday, April 16

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

(i) How many bits do we need for the output? [2 points]

(ii) Obtain the truth table for this circuit. [4 points]

(iii) Obtain simplified Boolean expressions of the circuit outputs in SOP form. [4 points]

Q2.

(i) What is the **minimum** number of bits needed to represent integers in the range from -100 to $+100$ using sign-magnitude representation? [2 points]

(ii) 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			

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

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