



CSE260: Digital Logic Design  
Spring 2025  
Quiz - 01  
Duration: 25 Minutes

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Name: <u>Solution</u>	ID:	Section:
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**Instructions:** Answer on the space provided.

**Question 1 [CO1]:** Add  $(37)_{10}$  with  $(-15)_{10}$  in 7-bit 2's complement number system. Justify whether there is an overflow or not. [5] marks

$$\begin{array}{r} 2 \overline{) 37} \\ 2 \overline{) 18} \quad 1 \\ 2 \overline{) 9} \quad 0 \\ 2 \overline{) 4} \quad 1 \\ 2 \overline{) 2} \quad 0 \\ 2 \overline{) 1} \quad 0 \\ \hline 0 \quad 1 \end{array}$$

$$(37)_{10} = (100101)_2$$

$$+37 \text{ in } 7\text{-bits} = (0100101)_{2's}$$

$$\begin{array}{r} 2 \overline{) 15} \\ 2 \overline{) 7} \quad 1 \\ 2 \overline{) 3} \quad 1 \\ 2 \overline{) 1} \quad 1 \\ \hline 0 \quad 1 \end{array}$$

$$(15)_{10} = (1111)_2$$

$$+15 \text{ in } 7\text{-bits} = (0001111)_{2's}$$

$$\begin{array}{r} -15 = 1110000 \\ +1 \\ \hline (1110001)_{2's} \end{array}$$

$$\begin{array}{r} \phantom{0} 1 \phantom{0000} \phantom{0000} \phantom{0000} \phantom{0000} \phantom{0000} \phantom{0000} \phantom{0000} \\ \phantom{0} 0 \phantom{0} 1 \phantom{0} 0 \phantom{0} 0 \phantom{0} 1 \phantom{0} 0 \phantom{0} 1 \\ + \phantom{0} 1 \phantom{0} 1 \phantom{0} 1 \phantom{0} 0 \phantom{0} 0 \phantom{0} 0 \phantom{0} 1 \\ \hline \cancel{0} (0 \phantom{0} 0 \phantom{0} 1 \phantom{0} 0 \phantom{0} 1 \phantom{0} 1 \phantom{0} 0)_{2's} \end{array}$$

Since we are adding two different signed numbers, there will be no overflow.

**Question 2 [CO1]:** Bangladesh is facing up against Australia in a cricket match. They have scored  $(154)_{16}$  runs in total. Australia has currently played  $(24)_8$  overs with a run rate of  $(110.1)_2$ . Calculate how many more runs they need to score to win the game. **Show your answer in decimal.** [10] marks

$$\begin{aligned}(154)_{16} &= 1 \times 16^2 + 5 \times 16^1 + 4 \times 16^0 \\ &= (340)_{10}\end{aligned}$$

$$\begin{aligned}(24)_8 &= 2 \times 8^1 + 4 \times 8^0 \\ &= (20)_{10}\end{aligned}$$

$$\begin{aligned}(110.1)_2 &= 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 + 1 \times 2^{-1} \\ &= (6.5)_{10}\end{aligned}$$

$$\begin{aligned}\text{Current runs} &= \text{Over} \times \text{Run rate} \\ &= (20)_{10} \times (6.5)_{10} \\ &= (130)_{10}\end{aligned}$$

$$\begin{aligned}\text{Runs needed to win} &= (340 - 130) + 1 \\ &= (211)_{10}\end{aligned}$$