

**BRAC UNIVERSITY**  
**Department of Computer Science and Engineering**  
**CSE 260: Digital Logic Design**

Examination: **Quiz 1**  
Duration: 25 Minutes

Semester: Spring 2025  
Full Marks: 15

Answer the following questions. You **MUST** show your workings/calculations where applicable.  
Figures in the right margin indicate marks.

Name: <i>Solution</i>	Section: <i>01</i>	ID:
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1. Perform the following conversion:  $(100101110011011)_{\text{Excess-4}} = (?)_9$   
**Note:** You **must** show all the necessary conversions. [4]
2. Subtract  $(-11)_{10}$  from  $25_{10}$  using **6-bit 2's complement** system (show the conversion first).  
Justify whether there is an **overflow or not**. [5]
3. **Divide  $(111231)_4$  by  $(123)_4$ . Find the quotient and remainder.**  
**Note:** You **must** show the necessary calculations. [6]

<i>1)</i> $(100101110011011)_{\text{Ex-4}}$ $\begin{array}{cccc} 0100 & 1011 & 1001 & 1011 \\ 4 & 11 & 9 & 11 \\ -4 & -4 & -4 & -4 \\ \hline 0 & 7 & 5 & 7 \end{array}$ $= (0757)_{10}$ $= (757)_{10} = (?)$	$\begin{array}{r} 9 \overline{) 757} \\ 9 \overline{) 84-1} \rightarrow L \\ 9 \overline{) 9-3} \\ 9 \overline{) 1-0} \\ 0-1 \rightarrow M \end{array}$ $(757)_{10} = (1031)_9$
$\Rightarrow (100101110011011)_{\text{Ex-4}} = (1031)_9 \text{ (Ans)}$	

<i>2)</i> $25 - (-11) = 25 + 11$ $\begin{array}{r} 2 \overline{) 11} \\ 2 \overline{) 10-1} \rightarrow L \\ 2 \overline{) 2-1} \\ 2 \overline{) 1-0} \\ 0-1 \rightarrow M \end{array}$ $\Rightarrow (11)_{10} = (1011)_2$ $+ 11 = 01011$ $= 001011$	$\begin{array}{r} 2 \overline{) 25} \\ 2 \overline{) 24-1} \rightarrow L \\ 2 \overline{) 6-0} \\ 2 \overline{) 3-0} \\ 2 \overline{) 1-1} \\ 0-1 \rightarrow M \end{array}$ $(25)_{10} = (11001)_2$ $+ 25 = 011001$	$\begin{array}{r} 001011 \\ + 011001 \\ \hline 100100 \end{array}$ <i>Here, we added two positive numbers but the answer has negative sign.</i> So, according to this rule, Adding two same signed numbers if answer has different sign, then overflow.
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*Yes, we have overflow here.*

3)

$$\begin{array}{r}
 \downarrow \downarrow \downarrow \downarrow \downarrow \\
 123 \overline{) 111231} \mid 000303 \\
 \underline{-0} \phantom{000000} \\
 11 \phantom{000000} \\
 \underline{-0} \phantom{000000} \\
 111 \phantom{00000} \\
 \underline{-0} \phantom{00000} \\
 1112 \phantom{0000} \\
 \underline{-1101} \phantom{000} \\
 113 \phantom{000} \\
 \underline{-0} \phantom{000} \\
 1131 \phantom{00} \\
 \underline{-1101} \phantom{0} \\
 30
 \end{array}$$

$$\text{Quotient} = (303)_4$$

$$\text{Remainder} = (30)_4$$

$$123 \times 0 = 0$$

$$123 \times 1 = 123$$

$$123 \times 2 = 312$$

$$123 \times 3 = 1101$$

$$\begin{array}{r}
 11 \\
 123 \\
 \times 2 \\
 \hline
 312
 \end{array}
 \quad
 4 \overline{) 61}$$

$$\begin{array}{r}
 22 \\
 123 \\
 \times 3 \\
 \hline
 1101
 \end{array}
 \quad
 4 \overline{) 51}$$

$$\begin{array}{r}
 22 \\
 123 \\
 \times 3 \\
 \hline
 1101
 \end{array}
 \quad
 4 \overline{) 92}$$

$$4 \overline{) 82}$$