





# Modern Digital System Design

ECE 2372 / Fall 2018 / Lecture 14

Texas Tech University  
Dr. Tooraj Nikoubin


## Arithmetic Circuits



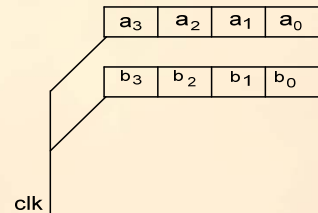
# SERIAL ADDER

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## Serial Adder

$$\begin{array}{r}
 a_3 a_2 a_1 a_0 \\
 + \\
 b_3 b_2 b_1 b_0 \\
 \hline
 C_0 S_3 S_2 S_1 S_0
 \end{array}$$


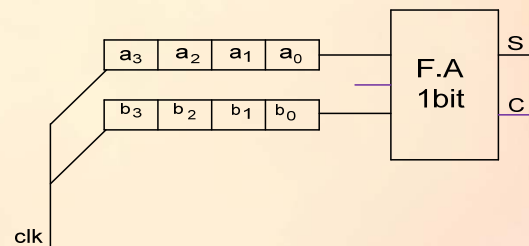
clk

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## Serial Adder

$$\begin{array}{r}
 a_3 a_2 a_1 a_0 \\
 + \\
 b_3 b_2 b_1 b_0 \\
 \hline
 C_0 S_3 S_2 S_1 S_0
 \end{array}$$


clk

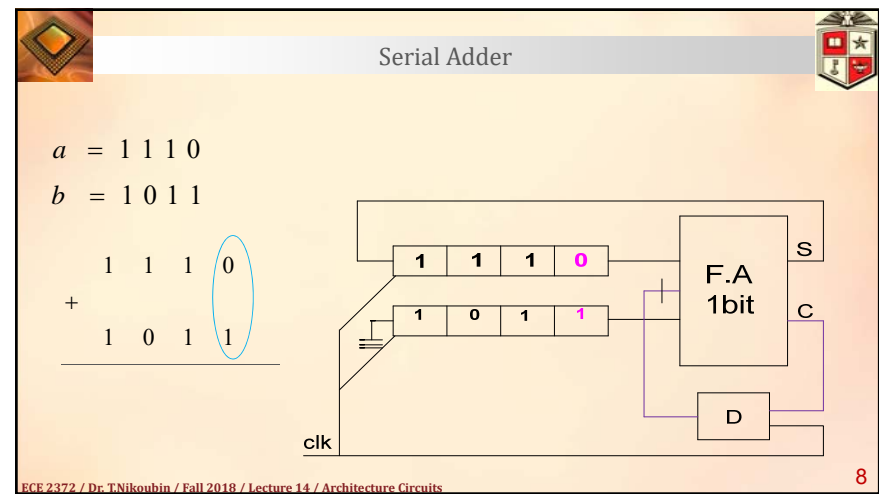
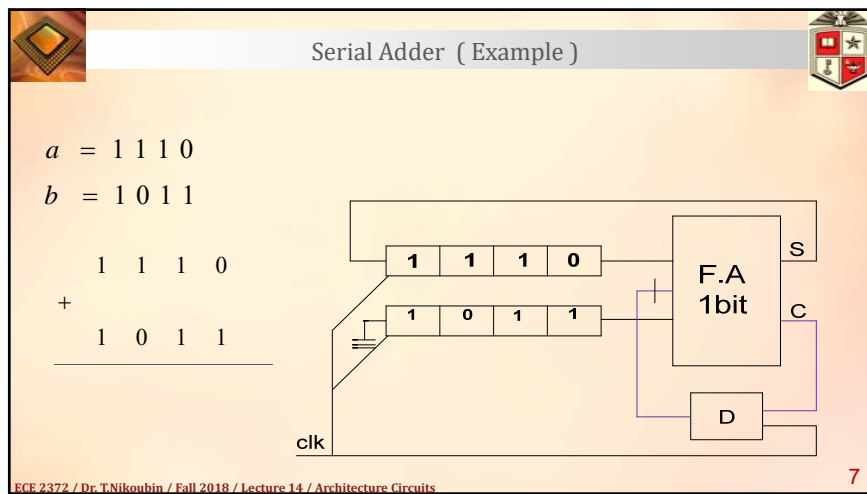
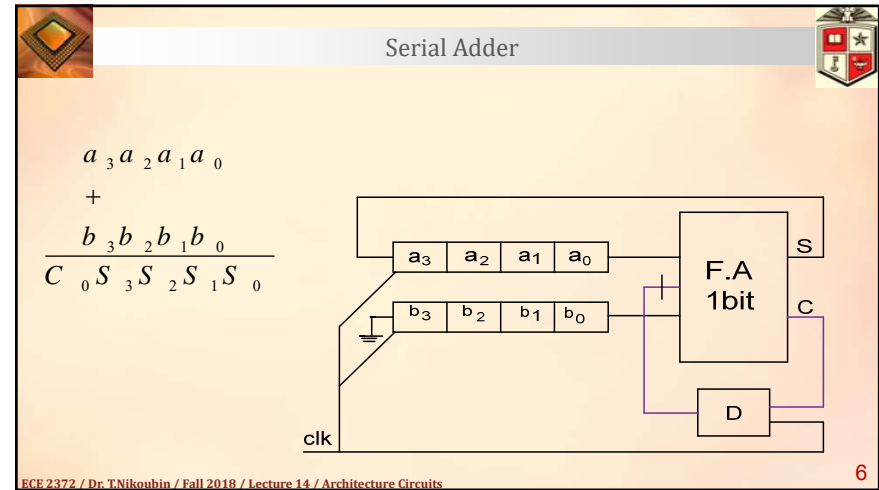
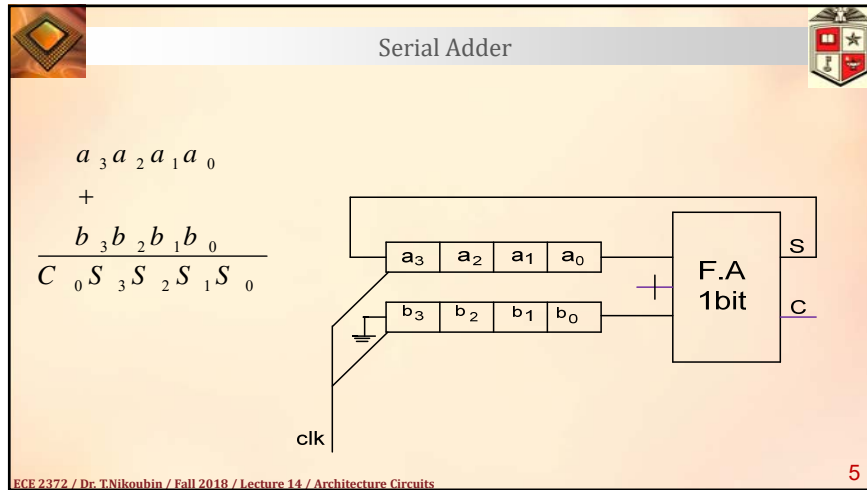
F.A 1bit

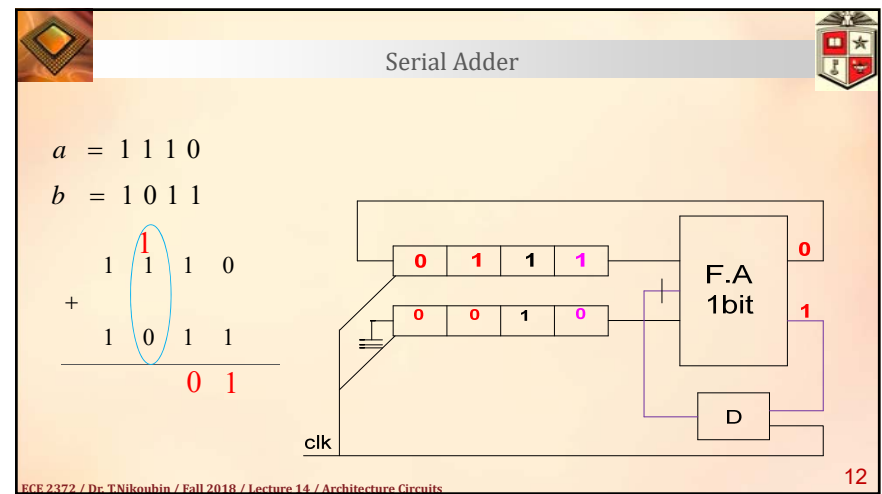
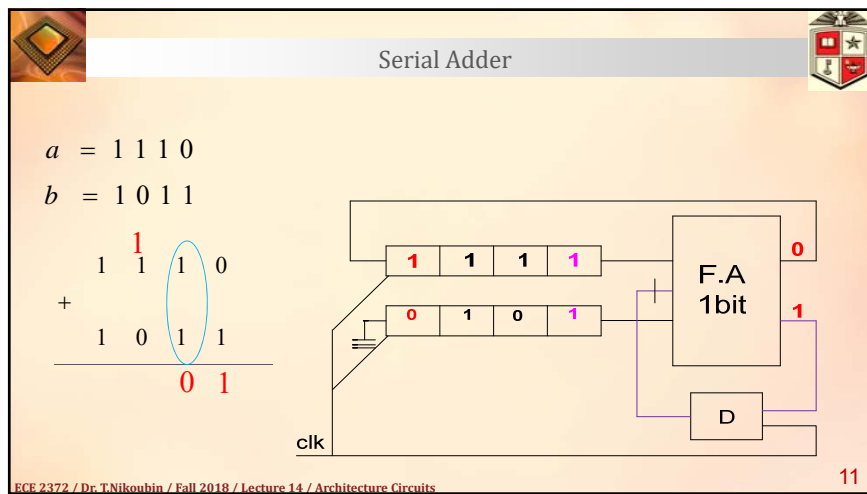
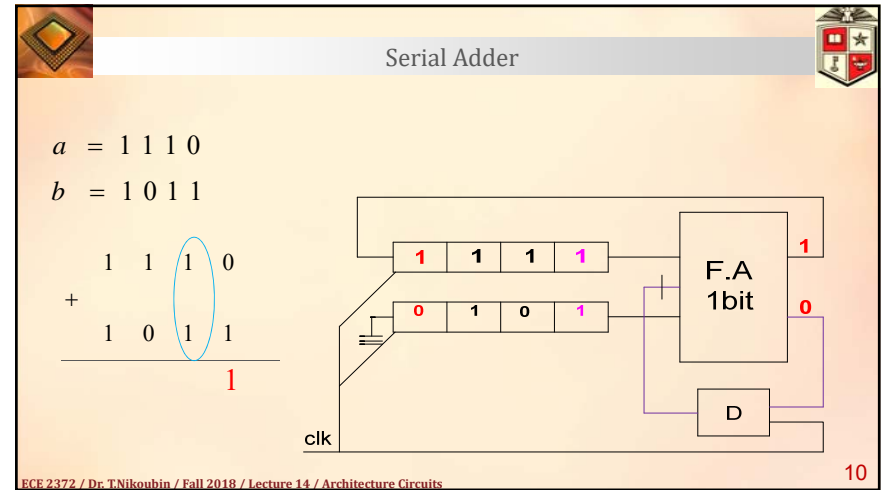
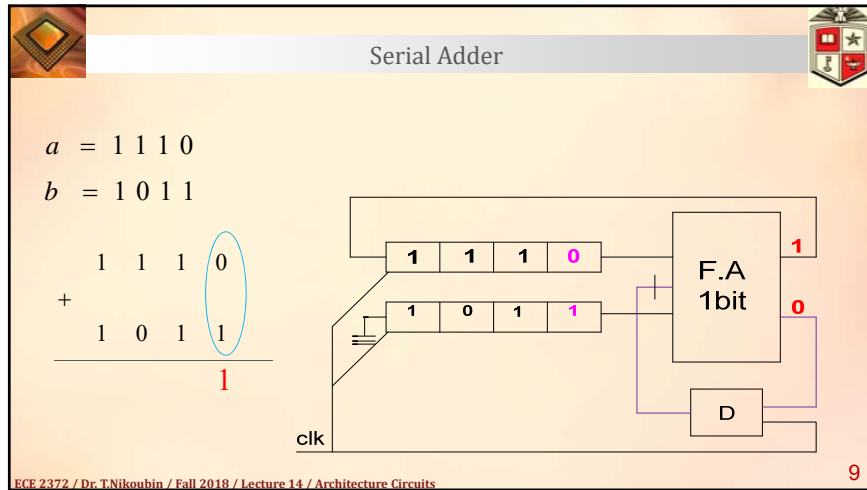
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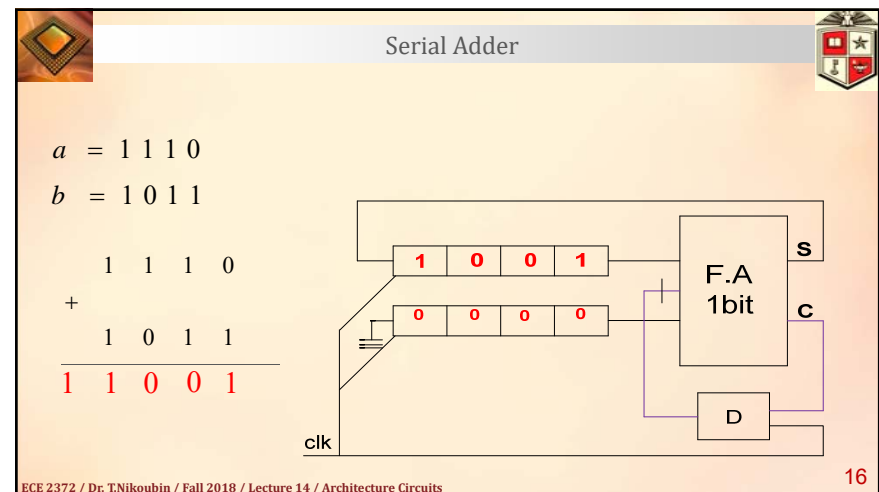
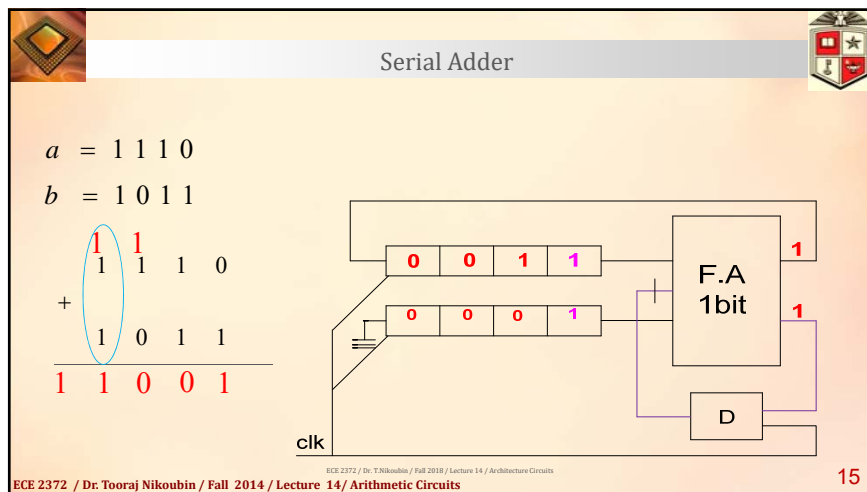
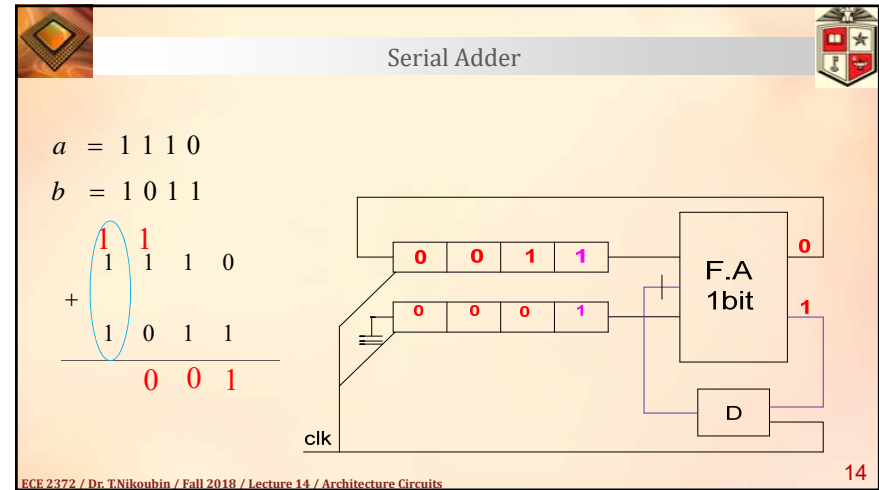
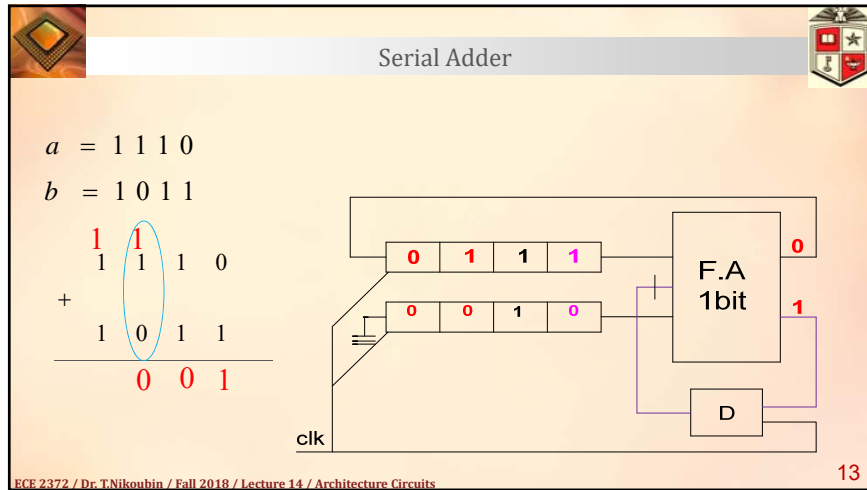
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# MULTIPLIER CIRCUIT

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## Multiplier circuit

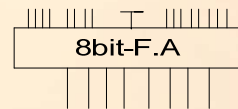
$$A * B = \underbrace{A + A + \dots + A}_{B \text{ times}}$$

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## Multiplier circuit

$$A * B = \underbrace{A + A + \dots + A}_{B \text{ times}}$$

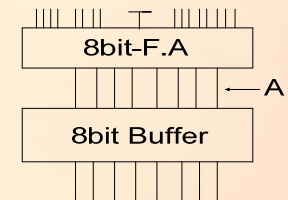


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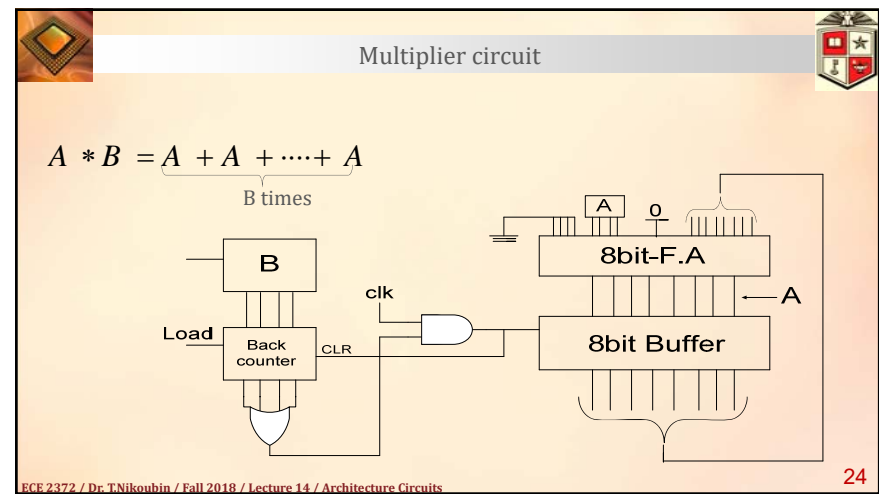
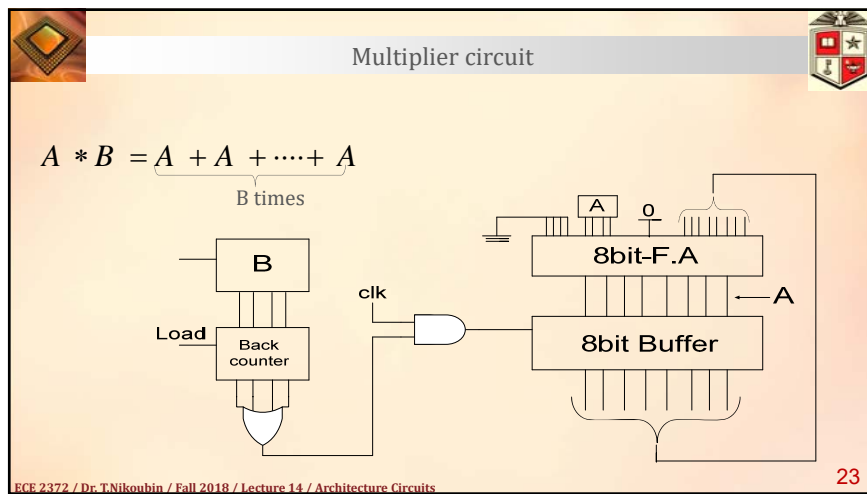
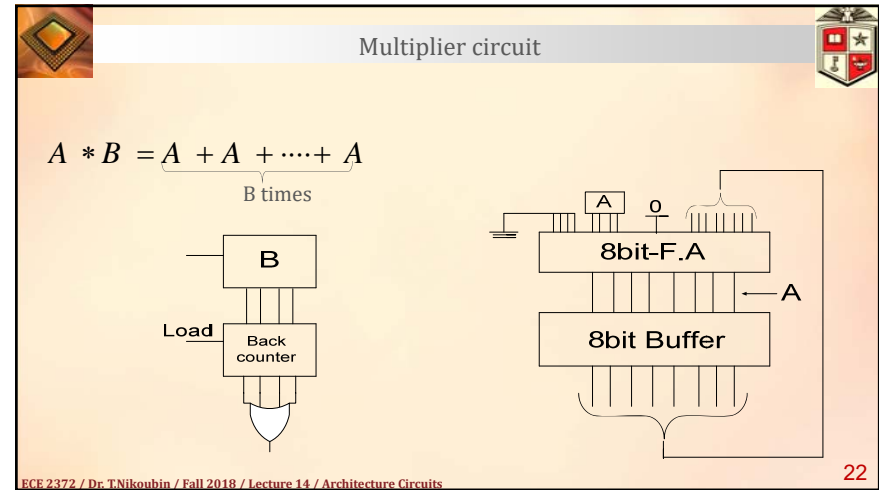
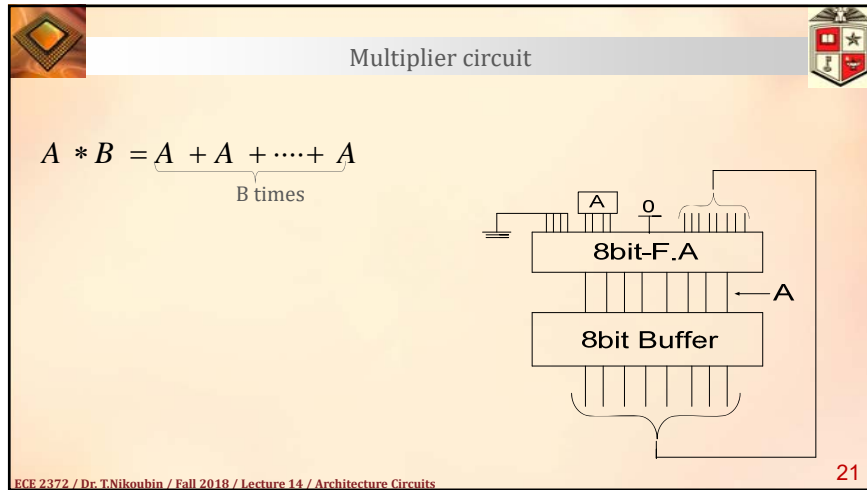
## Multiplier circuit

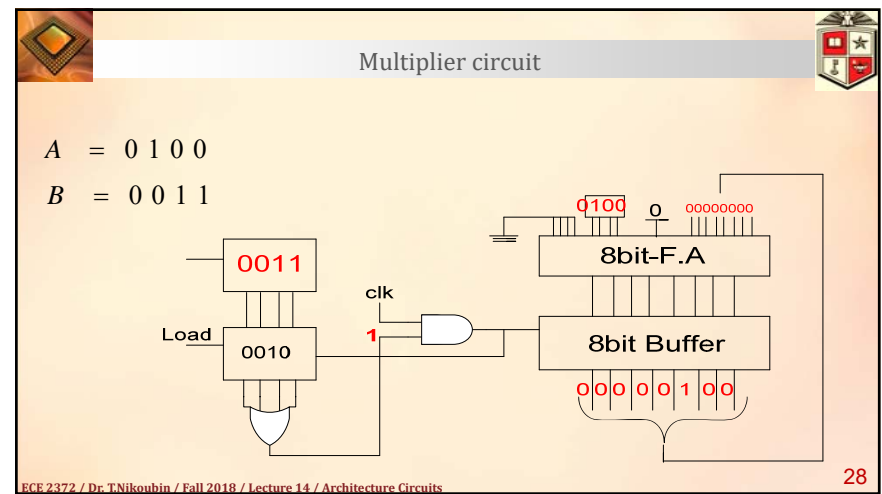
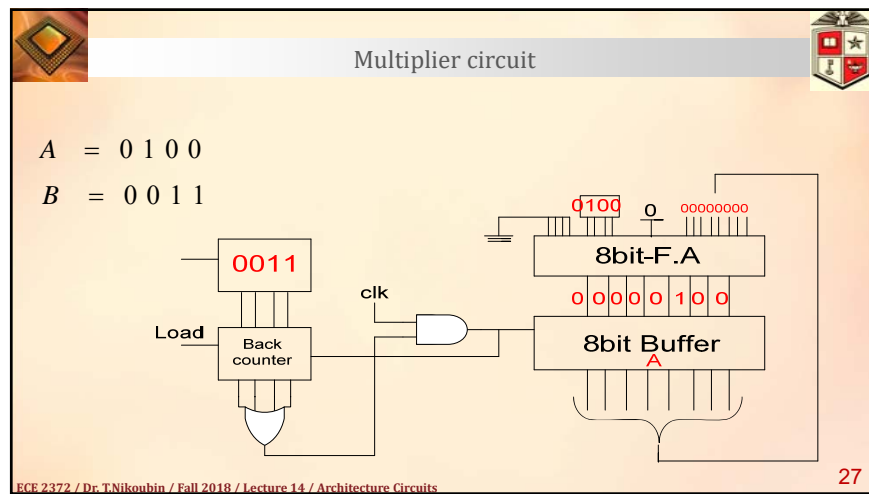
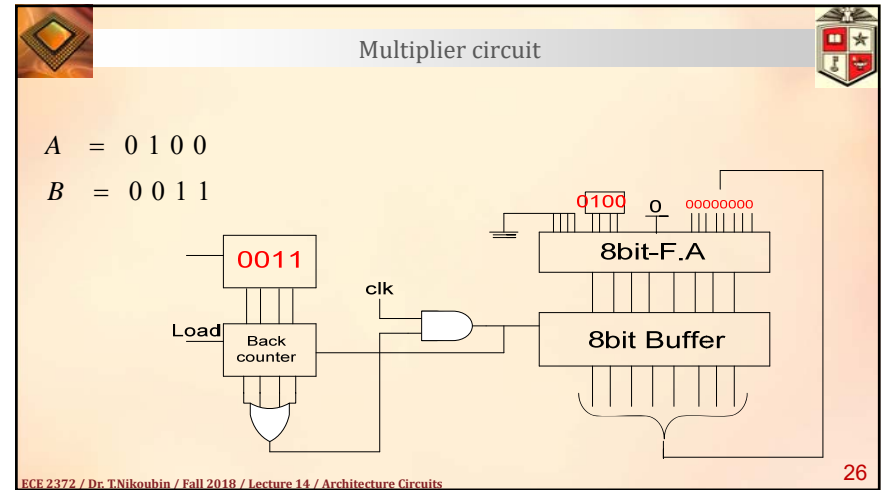
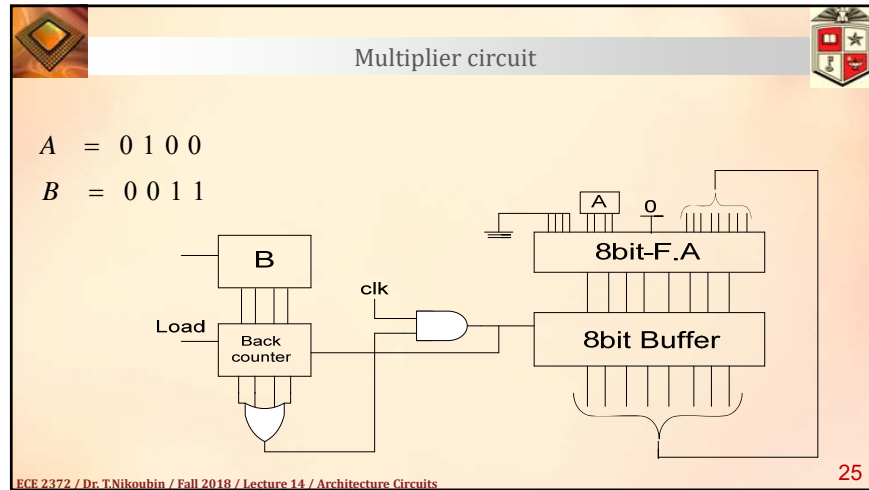
$$A * B = \underbrace{A + A + \dots + A}_{B \text{ times}}$$

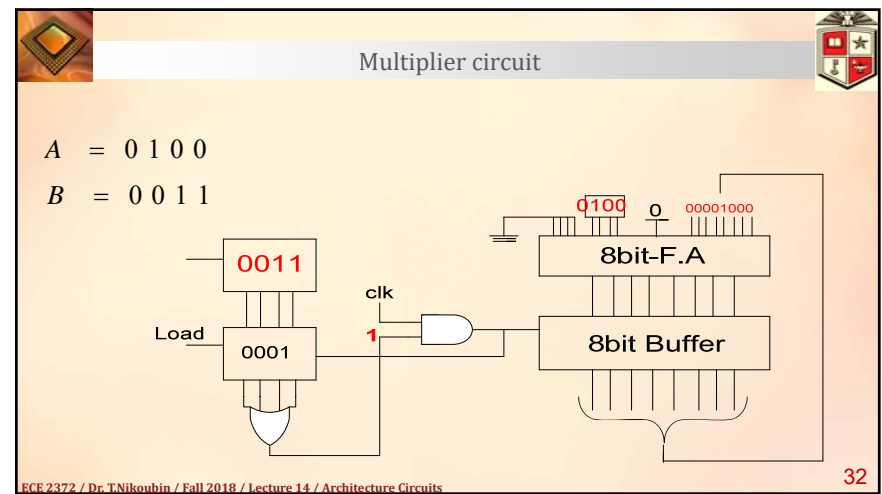
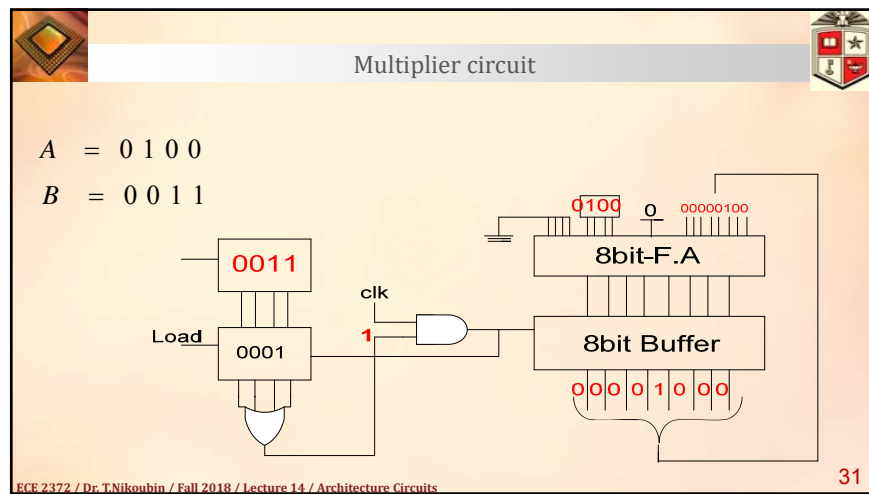
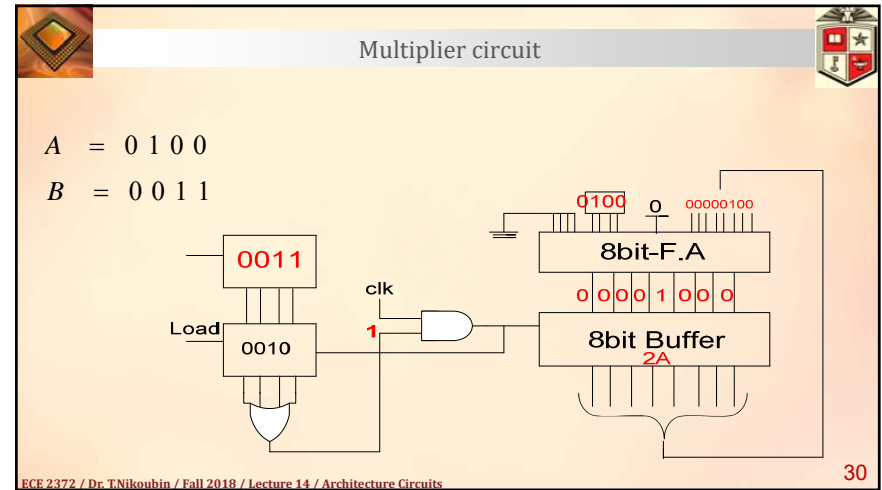
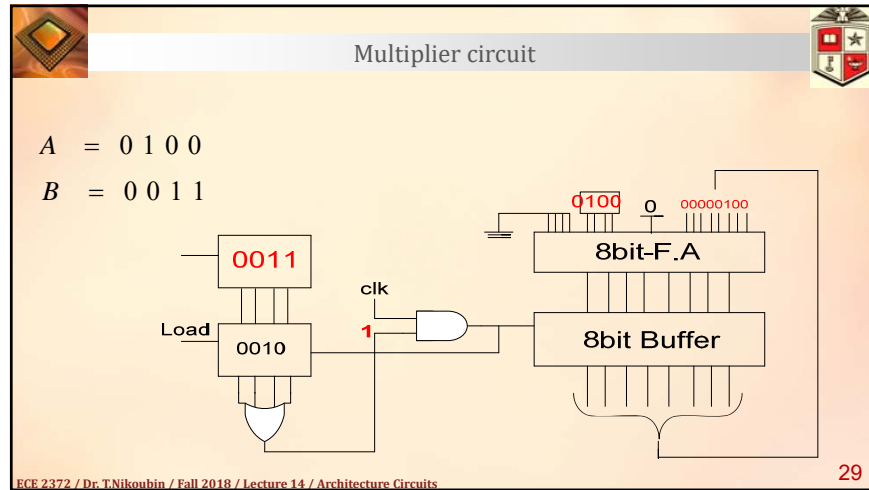


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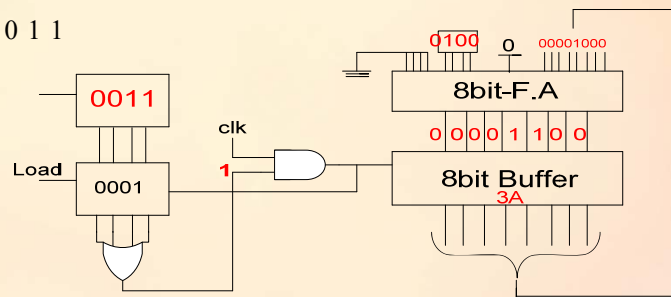




## Multiplier circuit

$$A = 0100$$

$$B = 0011$$



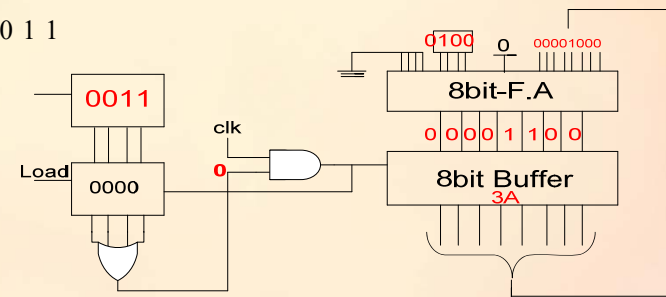
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## Multiplier circuit

$$A = 0100$$

$$B = 0011$$



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# DIVIDER CIRCUIT

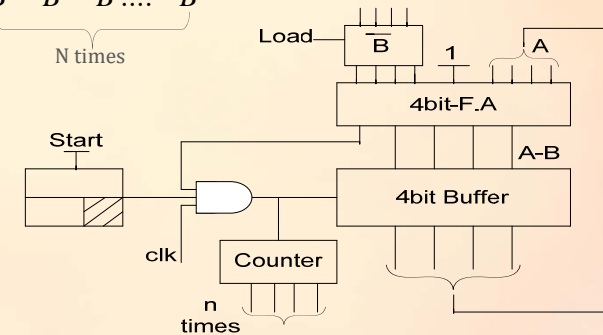
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## Divider circuit

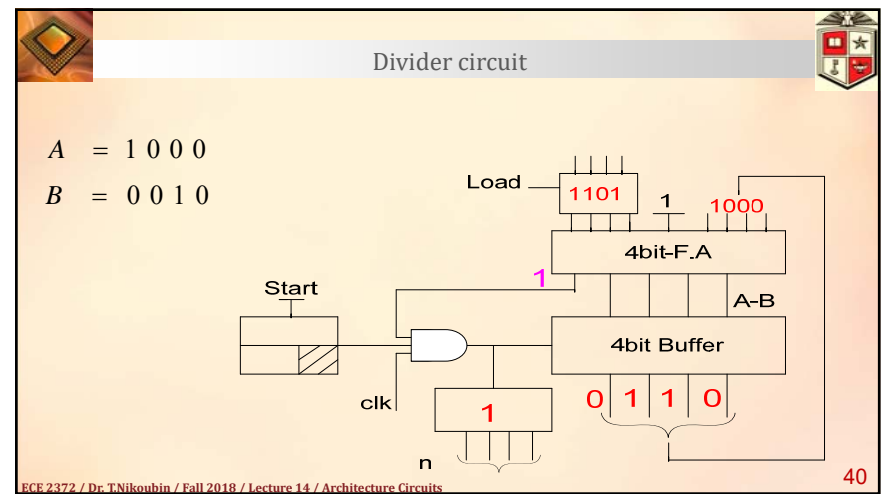
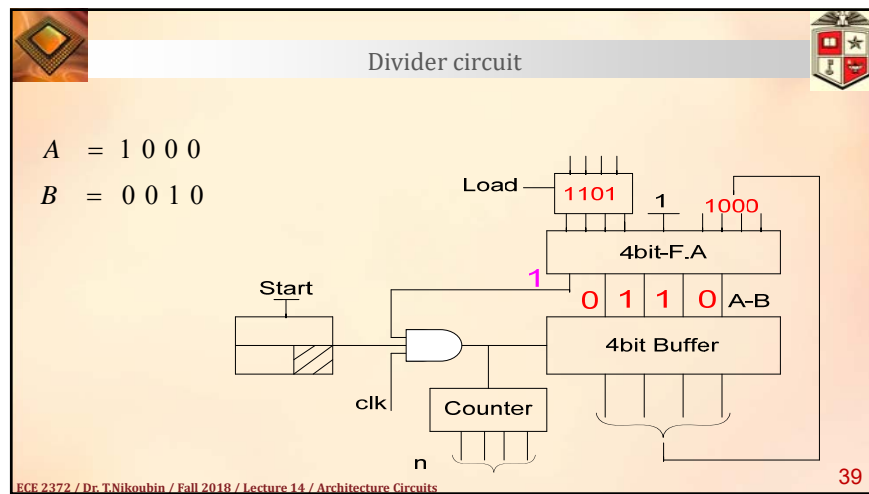
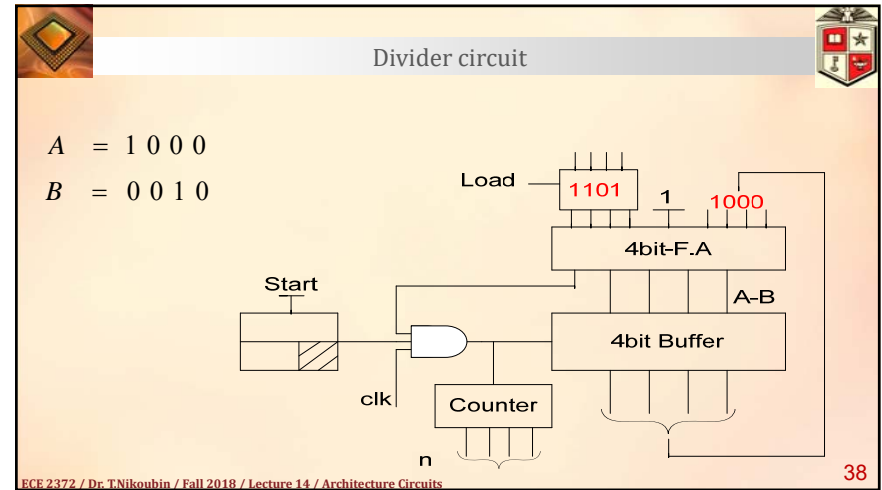
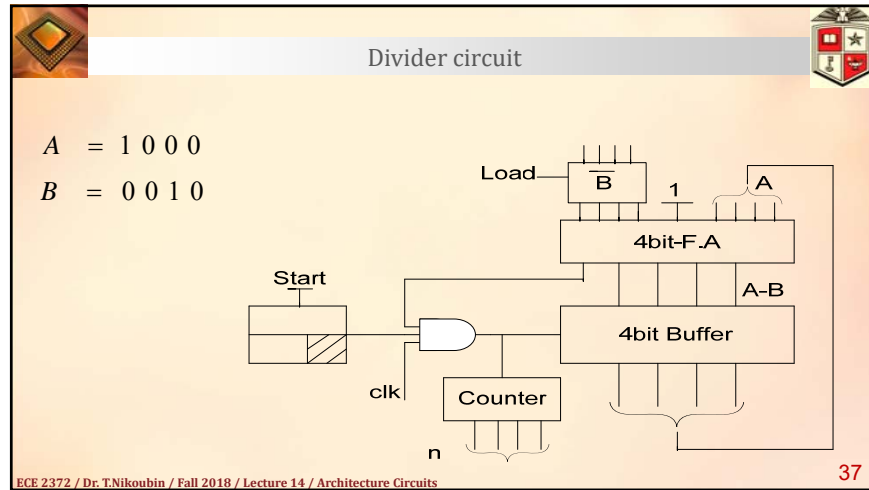
$$A \div B = A - B - B - B \dots - B$$

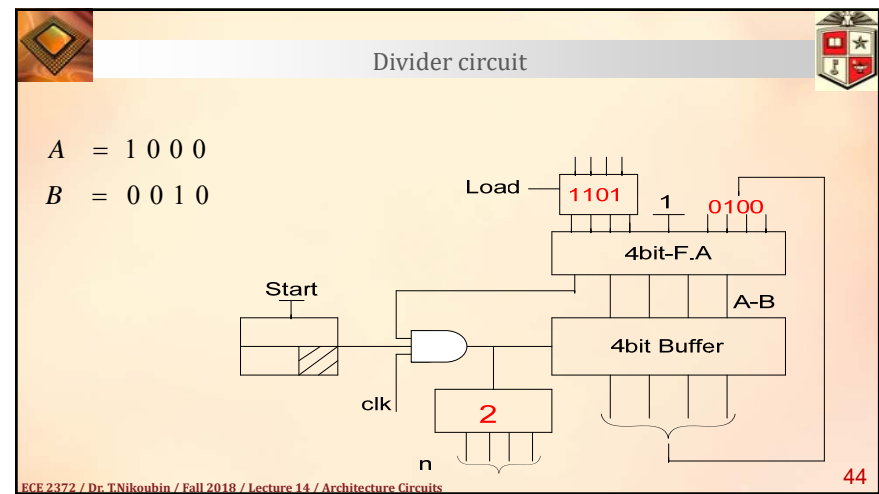
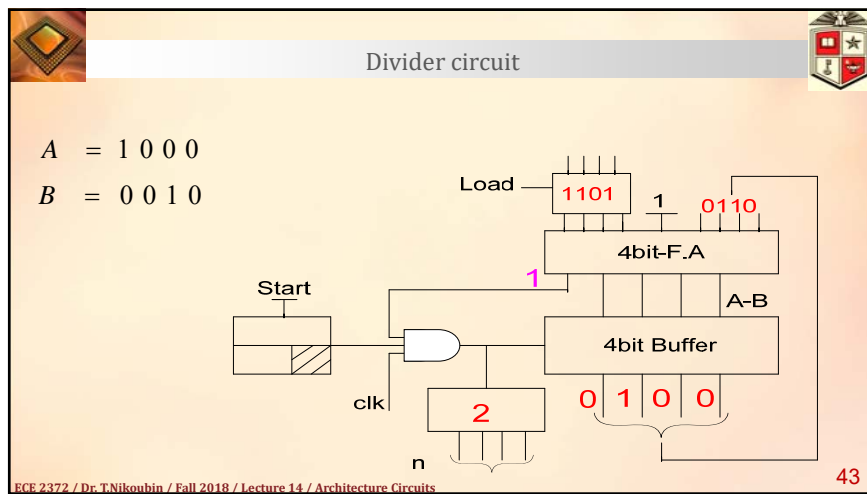
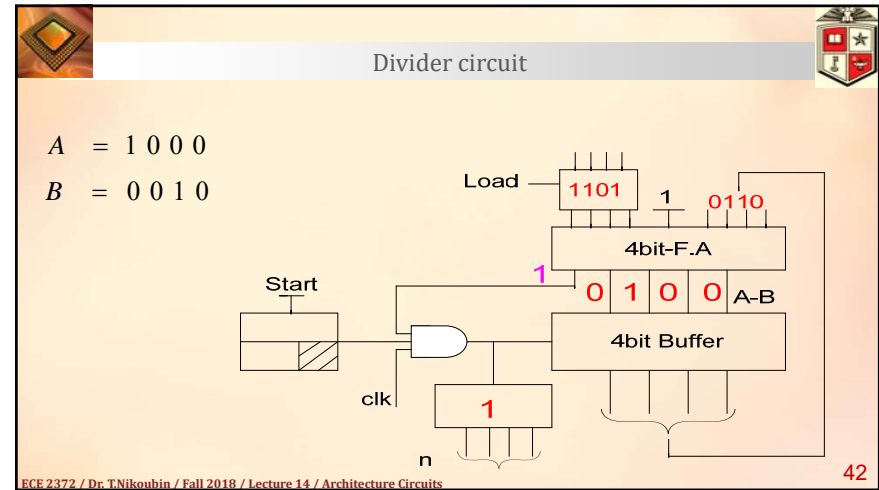
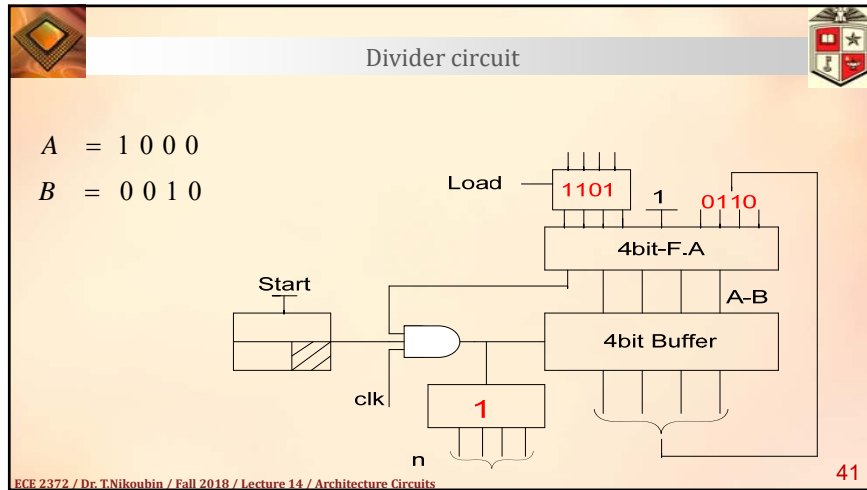
N times

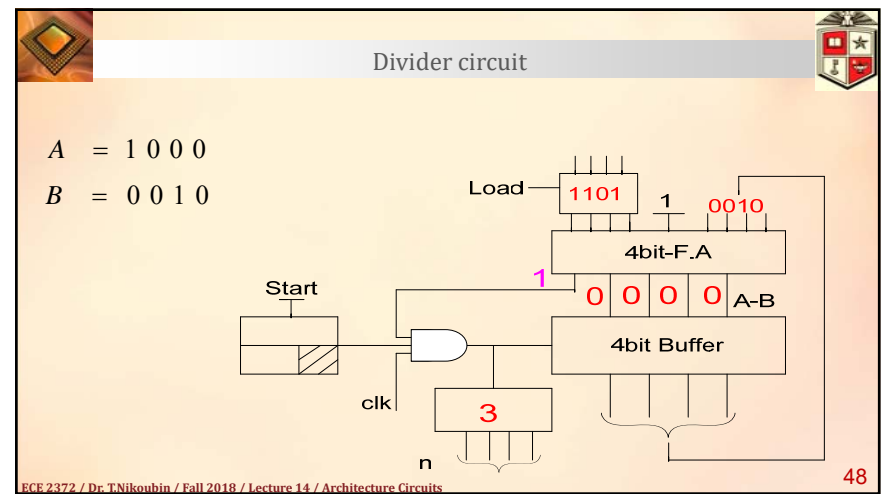
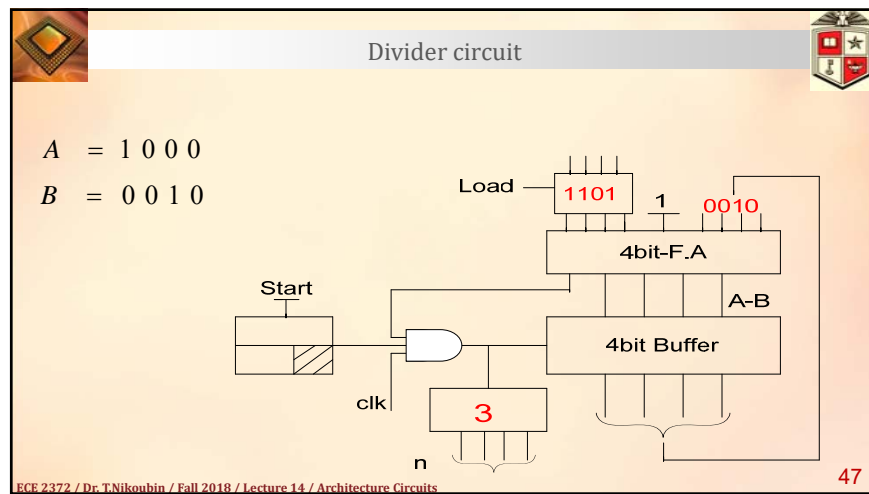
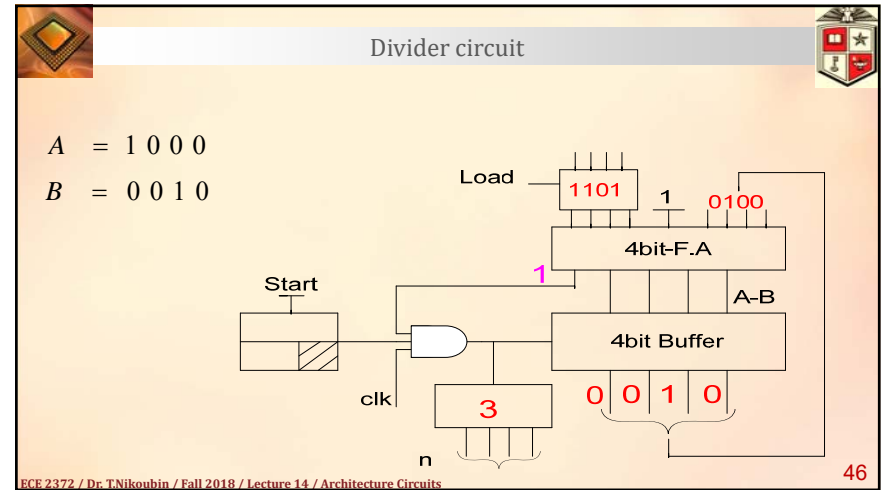
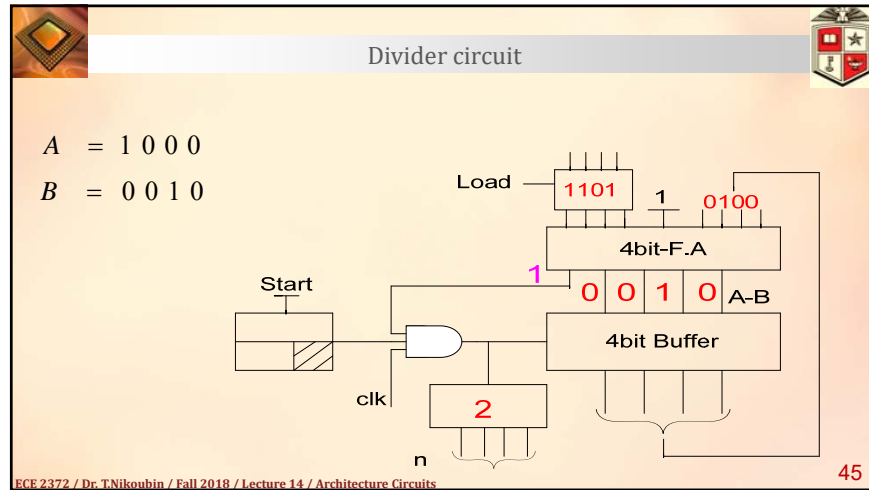


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**THANK YOU**