

**Midterm Exam  
Fall 2013  
Solutions**

**Problem 2A**

**A.**

$$\text{Execution Time}(N) = 1 + (1+64) \cdot (N-1) + 64 \cdot 8 = 448 + 65 \cdot N$$

**B.**

$$\text{Latency for every block different than the last} = 65$$

$$\text{Latency for the last block} = 1 + 64 \cdot 8 = 513$$

**C.**

$$\begin{aligned} \text{Minimum time between two consecutive input blocks} &= \\ &= \text{Execution Time}(N+1) - \text{Execution Time}(N) = 65 \end{aligned}$$

**D.**

$$\begin{aligned} \text{Throughput for short messages}(N) &= \\ &= \text{\#bits\_processed}(N) / \text{Execution Time}(N) = 8 \cdot N / ((448 + 65 \cdot N) \cdot T) \end{aligned}$$

**E.**

$$\begin{aligned} \text{Throughput for long messages} &= \\ &= \text{\#bits\_processed}(1) / \text{Minimum time between two consecutive input blocks} = \\ &= 8 / (65 \cdot T) \end{aligned}$$

**Problem 2B**

**A.**

$$\text{Execution Time}(100) = 448 + 65 \cdot 100 = 6948$$

**B.**

$$\text{Latency for every block different than the last} = 65$$

$$\text{Latency for the last block} = 1 + 64 \cdot 8 = 513$$

**C.**

$$\text{Minimum time between two consecutive input blocks} = 65$$

**D.**

$$\begin{aligned} \text{Throughput for short messages} &= 8 \cdot N / ((448 + 65 \cdot N) \cdot T) = \\ &= 8 \cdot 100 \text{ bits} / ((448 + 65 \cdot 100) \cdot 25 \text{ ns}) = \\ &= 800 \text{ bits} / (6948 \cdot 25 \cdot 10^{-9} \text{ s}) = 4.606 \text{ Mbit/s} \end{aligned}$$

**E.**

$$\text{Throughput for long messages} = 8 \text{ bits} / (65 \cdot 25 \text{ ns}) = 8 / (65 \cdot 25 \cdot 10^{-9} \text{ s}) = 4.923 \text{ Mbit/s}$$