►Solution◄

Question 1: (10 points)

The table below shows the CPI and the percentage of instructions of several classes instructions executed by a program in a given computer. This program executes 10000 instructions and completes its execution in 4.8 μs (1 $\mu s = 10^{-}6\ \ s$) and the processor clock cycle is 200 ps (1 $ps = 10^{-12}\ \ s$). What is the CPI for instructions of class C?

	Class A	Class B	Class C	Class D
CPI	1	2	►3◄	5
% of instructions	40	20	20	20

Solution:

$$\text{Execution Time} = \text{Instruction Count} \times \text{CPI} \times \text{ClockCycle}$$

$$\text{CPI} = \frac{\text{Execution Time}}{\text{Instruction Count} \times \text{ClockCycle}}$$

$$\text{CPI} = \frac{4.8\mu s}{10000 \times 200ps}$$

$$\text{CPI} = \frac{4.8 \times 10^{-6}\ s}{10000 \text{ instructions} \times \frac{200 \times 10^{-12}\ s}{\text{cycle}}}$$

$$\text{CPI} = \frac{4.8}{2 \times 1000000 \times 10^{-6}} = 2.4 \text{ cycles}$$

$$\text{CPI} = 0.4 \times 1 + 0.2 \times 2 + 0.2 \times x + 0.2 \times 5$$
$$\text{CPI} = 0.4 + 0.4 + 0.2 \times x + 1.0$$
$$\text{CPI} = 1.8 + 0.2 \times x$$

$$x = \frac{\text{CPI} - 1.8}{0.2}$$

$$x = \frac{2.4 - 1.8}{0.2} = 3$$