ASSIGNMENT

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Answers

1. Total clock cycles

Total cycles = Instruction Count × CPI = 10,000,000 × 1.8 = 18,000,000 cycles

2. Total execution time

Execution Time = Total cycles / Clock Speed = 18,000,000 / 2.5 × 10⁹ = 0.0072 seconds (7.2 ms)

3. CPI and Clock Speed impact

CPI (cycles per instruction) and clock speed (cycles per second) inversely affect performance. Lower CPI reduces cycles per instruction, while higher clock speed shortens cycle time. Together, they determine execution time: lower CPI or higher clock speed improves performance.

4. Speedup with CPI 1.2

New execution time = (10,000,000 × 1.2) / 2.5 × 10⁹ = 0.0048 seconds.

Speedup = Original time / New time = 0.0072 / 0.0048 = 1.5× faster.

5. Processor comparison

Original (2.5 GHz, CPI 1.8):

Execution time = 18,000,000 / 2.5 × 10⁹ = 0.0072 seconds.

New (3.0 GHz, CPI 2.5):

Execution time = (10,000,000 × 2.5) / 3.0 × 10⁹ = 0.0083 seconds.

Conclusion: The original processor is faster due to lower CPI outweighing the higher clock speed of the other.