計算機結構-hw01

40823117L 資工系 方國丞

Question 1

a. (2 * 15 ns) + (1 * 2 ns) = 32 ns

b. d = a * (b + c)

- 15 ns + 2 ns = 17 ns
- Only need one multiplication and one addition

Question 2

- Total clock cycles = (5 million * 1) + (2 million * 2) + (3 million * 3) = 17 million
- CPU execution time = 17 million / 100 MHz = 0.17 seconds

Question 3

- Computer X Instruction count = 10 seconds * 5 GHz = 50 billion
- Computer Y Instruction count = 10 seconds * 5 GHz * 1.2 = 60 billion
- Computer Y Clock rate = 60 billion / 6 seconds = 10 GHz
- Answer = (a) 10 GHz

Question 4

a.

- CPU execution time = (Instruction count A * CPI A) + (Instruction count B * CPI B) + (Instruction count C * CPI C) / Clock rate
- Compiler 1 = (5 billion * 1) + (1 billion * 2) + (1 billion * 3) / 4 GHz = 2.75 seconds
- Compiler 2 = (10 billion * 1) + (1 billion * 2) + (1 billion * 3) / 4 GHz = 4 seconds
- Answer: compiler 1 faster

b.

- MIPS = Instruction count / (CPU execution time * 10^6)
- Compiler 1 MIPS = 7 billion / (2.75 seconds * 10^6) = 2.545
- Compiler 2 MIPS = 12 billion / (4 seconds * 10^6) = 3
- Answer: compiler 2 faster

Question 5

- Overall speedup = 1 / [(1 - 0.2) + (0.2 / 10)] = 1.22
- Answer: (b) 1.22