CDA3101 – F13 – Quiz #2 **Fri 24 Sept 2013** **ANSWER KEY**

Given: **Instruction Types A, B, and C on M_1**
$CPI_A = 1.1$; $CPI_B = 2.7$; $CPI_C = 1.9$

Q1 (7 pts): **What is Average CPI of M_1** for program P_1 with 32% Type A instructions, 27% Type B, and the remainder Type C instructions? **Also, average CPI of M_1** for P_2 with 29% Type A instr's, 17% Type B, and remainder Type C instr's?

Q2 (13 pts): Let machine M_1 have **clock rate = 2.8 GHz**. Given CPIs for P_1 and P_2 **(from Q1)**, and **IC = 100**, calculate t_{EXE} for P_1 and P_2. ***Which is faster?***

20 pts total – You have 20 minutes to complete

CDA3101 Quiz 2 Solution

Q1:

$$CPI_{P1} = 0.32\left(1.1\frac{cyc}{inst}\right) + 0.27\left(2.7\frac{cyc}{inst}\right) + 0.41\left(1.9\frac{cyc}{inst}\right) = 1.86\frac{cyc}{inst}$$

$$CPI_{P2} = 0.29\left(1.1\frac{cyc}{inst}\right) + 0.17\left(2.7\frac{cyc}{inst}\right) + 0.54\left(1.9\frac{cyc}{inst}\right) = 1.80\frac{cyc}{inst}$$

Q2:

$$Runtime = \frac{CPI \cdot IC}{Clock\ Rate}$$

$$Runtime = (CPI)\cdot(IC)\cdot(Clock\ Period)$$

$$Runtime_{P1} = \frac{CPI_{P1}(100\,instr)}{2.8\,Ghz} = \frac{\left(1.86\frac{cyc}{instr}\right)(100\,instr)}{2.8\,Ghz} = 66.4\,ns$$

$$Runtime_{P2} = \frac{CPI_{P2}(100\,instr)}{2.8\,Ghz} = \frac{\left(1.80\frac{cyc}{instr}\right)(100\,instr)}{2.8\,Ghz} = 64.4\,ns$$

P2 is faster.