Quiz 7 (Fall 2022) - Solution

Course Name: Computer Organization   **Time: 20 mins**

Instructor: Dr. Ayaz ul Hassan Khan

Name: _____   Identification #: _____

Date: _____   Total Marks: ____10____   Marks Obtained: _____

Signature of Instructor: _____

Consider a processor with a 3.2 GHz clock rate and a CPI of 1.3. If the processor executes a program in 20 seconds. Calculate the following:

   A. **(2 marks)** Performance of the processor expressed in MIPS.

MIPS = Clock Rate / (CPI x 10^6)
MIPS = (3.2×10^9) / (1.3×10^6) = **2461.5**

   B. **(2 marks)** Find the number of cycles.

CPU Cycles = Execution Time x Clock Rate
CPU Cycles = $20 \times 3.2 \times 10^9$ = **64×10^9**

   C. **(2 marks)** Find the number of instructions.

Instructions = Execution Time x Clock Rate / CPI
Instructions = $20 \times 3.2 \times 10^9$ / 1.3 = **49.23×10^9**

   D. **(4 marks)** We are trying to reduce the execution time by 30%, but this leads to an increase of 10% in the CPI. What clock rate (in GHz) should we have to get this time reduction for the given program?

Target Execution Time = Original Execution Time x (1-0.3) = 20 x 0.7 = 14 seconds
New CPI = CPI x 1.1 = 1.3 x 1.1 = 1.43
New Clock Rate = Instructions x New CPI / Target Execution Time = 49.23×10^9 x 1.43 / 14 = **5.03 GHz**