MCSE503L - COMPUTER ARCHITECTURE AND ORGANISATION

Fall Semester2022-2023 Faculty Name: M.Narayana Moorthi

Digital Assignment 01

(1) Discuss the history behind the development of computers with neat sketch? Identify and discuss the various digital tools to simulate the design of ALU in detail?

(2) Write short notes on benchmark program?

(3) A benchmark program is run on a 40 MHz processor. The executed program consists of 100,000 instructions executions with the following instruction mix and clock cycle count:

Instruction Type	Instruction Count	Cycles per Instruction
Integer Arithmetic	45,000	1
Data Transfer	32,000	2
Floating Point	15,000	2
Control Transfer	8000	2

Determine the effective CPI, MIPS rate and execution time for this program?

(4) Consider three different processors P1, P2 and P3 executing the same instructions. P1 has 2.4 GHz and CPI of 1.5. P2 has 2.5GHz and CPI of 1.2. P3 has 3GHz and has a CPI of 2.3. Which processor has the highest performance expressed in instructions per second?

(5) Assume for arithmetic, load and store and branch instructions, a CPU has CPI's of 1, 12 and 5 respectively. Also assume that on a single processor a program requires the execution of 2.56E9 arithmetic instructions, 1.28E9 load and store instructions and 256 million branch instructions. Assume that each processor has 2GHz of clock frequency. Assume that as the program is parallelized to run over multiple cores, the number of arithmetic and load and store instructions per processor is divided by 0.7 x p (where p is the number of processors) but the number of branch instructions per processor remains the same. Find the total execution time for this program on 1, 2, 4 and 8 processors and find the speedup and efficiency?