CSE340: Computer Architecture

Assignment 1

Chapter 1

Question - 1:

What do you understand by "**Performance Via Prediction**" in terms of computer architecture? Give a proper example of it.

Question - 2:

Why is it important to keep redundancy while designing a system? **Explain** a scenario where this redundancy will be useful.

Question - 3:

a. **Explain** Amdahl's Law in your own words.
b. Can you relate/connect Amdahl's law with any of the design principles, mentioned below? Explain the reason with an example.

	Design Principle
1	Performance via Prediction
2	Performance via Pipelining
3	Make the common case faster
4	Use Abstraction to Simplify Design

Question - 4:

Narrate a scenario where increasing the throughput could also improve the response time. **Justify** your answer.

Question - 5:

Description	Name	Instruction Count x 10^9	CPI	Clock cycle time (seconds x 10^{-9})	Execution Time (seconds)	Reference Time (seconds)	SPECratio
Perl interpreter	perlbench	2684	0.42	0.556	627	1774	2.83
GNU C compiler	gcc	2322	0.67	0.556	863	3976	4.61
Route planning	mcf	1786	1.22	0.556	1215	4721	3.89
Discrete Event simulation - computer network	omnetpp	1107	0.82	0.556	507	1630	3.21
XML to HTML conversion via XSLT	xalancbmk	1314	0.75	0.556	549	1417	2.58
Video compression	x264	4488	0.32	0.556	813	1763	2.17
Artificial Intelligence: alpha-beta tree search (Chess)	deepsjeng	2216	0.57	0.556	698	1432	2.05
Artificial Intelligence: Monte Carlo tree search (Go)	leela	2236	0.79	0.556	987	1703	1.73
Artificial Intelligence: recursive solution generator (Sudoku)	exchange2	6683	0.46	0.556	1718	2939	1.71
General data compression	xz	8533	1.32	0.556	6290	6182	0.98
Geometric mean	–	–	–	–	–	–	2.36

To calculate the **benchmark** of a system, why do we take the **geometric mean** instead of only taking the **average** of the individual spec ratios?

Question - 6:

In the context of evaluating CPU performance, three key factors are considered:

1. Instruction Count
2. CPI (Cycles Per Instruction)
3. Clock Rate

Which of these factors are affected by the choice of programming language, and in what way?