

CS 2340 Assignment 1

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Question 1

Aside from the smart cell phones used by a billion people, list and describe four other types of computers.

- a) Personal computers (PCs): these are meant to be used by a single person at a time. Designed to be easy to use and affordable.
- b) Supercomputers: these are the most powerful computers in the world. They are used for complex scientific and engineering problems, such as weather forecasting, climate research, and nuclear simulations.
- c) Servers: these are normally stored in data centers for running software applications that serve many users. They are designed to be reliable and scalable.
- d) Embedded computers: these are small, lightweight computers that are built into other products and are dedicated to a specific task. They are used in cars, airplanes, and consumer electronics.

Question 2

Match the seven great ideas in computer architecture to ideas from other fields.

- a) Assembly lines in automobile manufacturing - **Performance via pipelining**
- b) Suspension bridge cables - **Dependability via redundancy**
- c) Aircraft and marine navigation systems that incorporate wind information - **Performance via prediction**
- d) Express elevators in buildings - **Common case fast**
- e) Library reserve desk - **Hierarchy of memories**
- f) A weather simulation model that runs on a supercomputer - **Performance via parallelism**
- g) Building self-driving cars - **Use abstraction to simplify design**

Question 3

Assume a color display using 8 bits for each of the primary colors (red, green, blue) per pixel and a frame size of 1280×1024

- a) **What is the size of the frame buffer in bytes?** We have $1280 \times 1024 = 1,310,720$ pixels. Each pixel uses 24 bits, so the frame buffer size is $1,310,720 \times 24/8 = 3,932,160$ bytes.
- b) **How long does it take to transmit the frame buffer over a 100 Mbit/s network?** it takes $3,932,160 \text{ bytes} \times 8 \text{ bits/byte} / 100,000,000 = 315$ seconds.

Question 4

Assume a 15 cm diameter wafer has a cost of 12, contains 84 dies, and has $0.020 \text{ defects/cm}^2$.

Assume a 20 cm diameter wafer has a cost of 15, contains 100 dies, and has $0.031 \text{ defects/cm}^2$.