1. Review textbook supplement material 5.11, located on Blackboard. Write about each of the various levels of RAID - how they are similar and how they differ. (20 pts)

Answer:

Raid 0 – one set of data that spans across multiple drives. Faster read and write speeds due to the drives being able to read and write at the same time. No redundancy, so if one drive fails your data is corrupt.

Raid 1 – Redundancy. For every drive you have data one, there is another one that is a clone of it. This basically leaves you with two “sets” of drive, one main set, and one set that is an exact copy of the main set drive for drive. If one in your main set fails, it starts reading from the copied drive.

Raid 2 – Error detection and correction

Raid 3 – Similar to Raid 0, but with some redundancy. All read’s, writes, and data are across a set of disks. Then One disk has all the data on it. If one drive fail, just the needed info is read from the master disk.

Raid 4 – Similar to Raid 3. Instead though, when checking for errors a small block will only be check with one other drive. For large blocks, the check will use multiple drives to cut down access time. For writes, all other drives must be accessed to read the info for the new block.

Raid 5 – Similar to Raid 4, but the partity is spread across all drives instead of being on one.

1. Review textbook supplement material 5.17, located on Blackboard.

* Write 4 – 5 sentences about what you learned (15 pts) AND

Answer: One of the first things I learned that mercury was once used as a replacement for vacuum tubes. Another one is that the integrated circuits we use today first came out in the early 70’s. Also that cache similar to what we used today came out in the late 60s.

* Calculate the approximate cost per copy of the 500,000 copies of MS-DOS Microsoft sold in 1983 (5 pts).

Answer: with 500,000 copies being sold, and $10 million being the income Microsoft made from that. 10,000,000/500,000 = 20 dollars per copy.

1. Using information from the textbook Chapter 5, review page381 – 383: Disk Memory

* Write 2 to 3 sentences explaining Average rotation latency (10 pts) AND

Answer: On a HDD the read/write head is a mechanism that allows for read and writing of data on a platter. The read/write head only moves one direction, closer to or father away from the center of the platter. So once the head is at a certain point to read the data, it must wait to read until the platter rotates back around to where that data is. The time it take for it to rotate back to the head is the Average Rotation Latency.

* Calculate the average rotational latency of a disk rotation at 12,000 RPM. Answer should be in milliseconds. (10 pts)

Answer: 2.5 ms

1. Using information from the textbook Chapter 5, review pages 400-402: Calculating Cache Performance. In 4 – 5 sentences, explain what happens if the processor is made faster, but the memory system is not. Answer must include information about the execution time spend on memory stalls. (20 pts)

Answer: The amount of time taken for memory stalls would take up most of the execution time. Since the processor is faster, it will take less than than before. So with that, the memory stalls will take up a much higher percentage of the total time.

1. Using information from the textbook Chapter 5, review pages 418-419: MTTF vs AFR of Disks.

* Write 4 – 5 sentences explaining the formula used for Availability (10 pts) AND

Answer: Availability is Mean Time To Failure divided by (Mean Time To Failure plus Mean Time To Repair). It is the percentage of time a certain service is down/up. As things will eventually fail, if your Time To Repair is quicker your Availability will go up. As that means that the service minimizes the time that it is down.

* Calculate the number of disks fails per day given an MTTF of 800,000-hour (5 pts) AND

Answer: With 100,000 disks, we would expect about 3 disks to fail each day.

* Define the following terms: Fault avoidance, Fault tolerance, and Fault forecasting. (5 pts)

Answer: Fault Avoidance – Preventing fault occurrence by construction.  
Fault Tolerance – Using redundancy to allow the service to comply with the service specification despite faults occurring.  
Fault Forecasting – Predicting the presence and creation of faults, allowing the component to be replaced before it fails.

**Bonus:** (+ 20pts) Review the following article. Write 2 complete paragraphs about what you learned about cache and how it has evolved.

<https://www.extremetech.com/extreme/188776-how-l1-and-l2-cpu-caches-work-and-why-theyre-an-essential-part-of-modern-chips>