Computer systems administration TE2003

Administration av datorsystem TE2003

29th October 2008

14:00 – 18:00

IDE, Högskolan i Halmstad

Examinator: Magnus Jonsson, IDE-sektionen
Course Responsible: Kristoffer Lidström, IDE-sektionen tel. 16 73 85

Grades: 25p => 3
                     33p => 4
                     42p => 5

Number of questions: 16
Maximum points: 50
Number of pages: 2
No extra materials (calculators, books etc.) are allowed

Kom ihåg:
- Skriv namn på varje blad
- Numrera bladen
- Numrera svaren tydligt, siffra och ev. bokstav, t.ex. 7 a)
- Svara på frågan. Tänk på att många poäng kräver längre svar och få poäng kortare svar. Om du skriver ovid-kommande eller felaktiga uppgifter i svaret kan det bli poängavdrag.
- Svara **antingen** på svenska **eller** på Engelska

Lycka till!

Remember:
- Write your name on each sheet of paper
- Number the sheets
- Number your answers clearly, number and possible letter, e.g. 7 a)
- Answer the Question. Many points will demand a longer answer and few points a shorter. If you answer with irrelevant or erroneous information, points may be deducted on that question.
- Answer either in English or in Swedish

Good luck!

1.   Describe the similarity between relays, vacuum tubes and transistors and how this similarity has made them so useful in the design of computers.   (3p)
          All three work as controllable <u>switches</u> that can be <u>connected together</u> in order to create <u>digital logic circuits.</u>

2.   Give three reasons why transistors rather than relays are used in modern computers   (3p)
          <u>Smaller size</u>, <u>cheaper to construct</u>, <u>faster</u>, <u>lower power</u>, <u>more reliable</u>.

3.   What are two advantages of the Harvard architecture over the Von Neumann architecture?   (3p)
          <u>Higher speed</u> because both instruction and data memory can be accessed simultaneously, memories can be implemented using <u>different technologies</u>.

4. a)   Explain what the term "Von Neumann Bottleneck" refers to
   b)   Explain how modern computers handle this bottleneck and how the solution works   (5p)
          The "Von Neumann Bottleneck" refers to the fact that <u>as processors get faster and faster the relatively slow transfer of data and instructions from main memory to the CPU becomes a limiting factor.</u> The solution to this is to use <u>cache memory</u>. <u>Cache memories are smaller and faster (but more expensive) memories designed to hold data that is used often</u> (or will be needed soon) in order to mitigate the slow transfer speeds from main memory.

5.   Describe the difference between how information is stored on a hard disk drive (HDD) and a compact disk (CD).   (3p)
          In most hard drives data is stored by <u>altering the magnetic properties</u> of a metal layer on one or several rotating disks inside the HD chassis (SSD drives use transistor based storage). On a CD a laser is used to <u>change the reflectivity of a non-magnetic layer</u> on a plastic disc.

6.   Illustrate how the North-Bridge (NB) and South-Bridge(SB) chipsets are connected to the Central Processing Unit (CPU) and give examples of which other types of devices/buses are connected to the NB and SB.   (3p)
          NB/SB figure from lecture 2 (pp. 35) <u>NB/SB/CPU</u>, <u>NB-Devices</u>, <u>SB-Devices</u>

7. a)   In exercise 1 you used benchmark programs to measure the performance of the CPU. There are two main types of benchmarks, *application-based* and *synthetic*. What is the basic difference between these two types?
   b)   What are the reasons for choosing application-based benchmarks over synthetic benchmarks in some situations?   (4p)
          a) Application-based benchmarks simulate typical work that is to be performed on the machine, e.g. office applications for a desktop PC or a database server for a mainframe machine. Synthetic benchmarks do not have to simulate this workload but can be any generic computation, e.g. calculating prime numbers. b) The advantage of application-based benchmarks is that they allow the tester to

compare systems/components using workloads that are similar to what the system
will see when in use.

8. Describe what occurs during the POST phase when a PC boots as well as what
    POST stands for.   (3p)
    Power-On-Self-Test is the stage where the BIOS performs tests of the most basic
    components needed for the system to boot. If a problem is detected this is
    indicated via a so-called beep-code through the system speaker.

9. What is the BIOS? What does the abbreviation stand for? What does it contain
    and where is it located?   (4p)
    Basic Input/Output System. Minimal software/routines used to initialize
    components in the PC. Performs the POST tests. Resides in its own memory
    (often flash). Is configurable. Can be rewritten/reflashed. Is needed for the system
    to boot.

10. a) What is the purpose of *root cause analysis (RCA)*?
    b) Give an example of a simple stepwise method for performing RCA that we
       covered in the course.   (3p)
       a) RCA is used in order to find the underlying cause of a problem rather than
       treating a symptom, the idea is that if the root cause is addressed the problem will
       seize to appear. b) "The Five Why's" was covered during the course, the basic
       idea is to ask "why" at least five times in order to finally reach a root cause.

11. What is the difference between a Megabyte (MB) and a Mebibyte (MiB)? Which
    is larger?   (2p)
    The prefix Mega strictly means 1000^2 while Mebi has been created to denote the
    power of two that is closest to 10^6 i.e. Mebi = 2^20 = 1024^2. This means that a
    Mebibyte is larger than a Megabyte.

12. Give three reasons for partitioning a hard drive.   (3p)
    Use different filesystems. Use different operating systems. Separate
    content/virtual disks. Avoid fragmentation

13. What does tracks, sectors and cylinders refer to in the context of hard drives?
                                                                           (3p)
    Track = concentric circles on a platter of the HD. Sectors = Parts of tracks, as if
    the platter was sliced like a pizza. Cylinders = Tracks in the same position on
    multiple platters make up the wall of a cylinder.

14. What is filesystem fragmentation, what problems does it cause, how is
    fragmentation removed?   (3p)
    When clusters of data belonging to a file are not placed consecutively on the
    drive. This causes longer access times since the HD has to seek to multiple
    positions. Defragmentation can be applied to reorder clusters so that they are
    placed in order.

15.   What is the basic mechanism behind a journaling filesystem and how does a
        journaling filesystem protect data when the system crashes?   (3p)
        Disk operations are <u>written to a log </u>before being written to the actual disk. If the
        <u>system fails before writing all changes to the log the log is cleared</u> when the
        system restarts. If the <u>system fails when the log is being written to disk the log is
        replayed</u> when the system restarts.

16.   What are the advantages of server-side dynamic web content over client-side
        dynamic web content? What are the disadvantages?   (2p)
        SS content means that the client can be simple, code is not sent to the client. SS
        loads the server more if there are many clients, SS content also has to be
        generated on the server and sent to the client which takes time.