

Homework 4

BASICS OF COMPUTING
(CSCE 101, SPRING 2007)
URL: <http://my.unl.edu>
9th March, 2007

Due on 3rd April, 2007

Name :
Course No : **CSCE101**

Instructions:

- **You may neatly print the answers on a printed version of this assignment!**
- If your answers take more than one page, **staple** your homework. Failure to do so may result in portions of the homework being lost. In addition, there will be an automatic 5deduction from the homework grade.
- You must **show all steps of your work for full credit**. Do not simply write final answers for a problem if it involves intermediate steps. In most cases, you will show your work in the same manner that you would for a math class. Writing a short essay describing how you solved the problem is unnecessary.
- The only way to submit your homework is in class at the beginning of the class when it is due.

1 Explore Your Machine

In this problem, you will explore the processes that are running on your machine.

NOTE: This question is designed for the Windows operating system. If you use other operating systems, you may need to look up how to obtain the required information.

1. (15 points) To answer this question correctly, follow the instructions below:
 - i. Turn on your PC. Make sure that you **do not open** any specific application!
 - ii. Press the **Ctrl + Alt + Delete** buttons (all at the same time). This should open the task manager icon on your computer (on some machines, as those in school, after you press **Ctrl + Alt + Delete**, you will need to choose the option 'task manager' from the available options).
 - iii. You should now be able to see the task manager window (See the figure from Chapter 3 notes). On top of this window is a menu that contains several options: Applications, processes, performance, etc. In the rest of this question, these options will be referred to as *tabs*, for instance, the process tab, application tab, etc.
- (a) Open the process tab from the menu bar. How many processes are running on your machine?
- (b) Why are there several processes running on the machine, even though you did not open any applications yet?
- (c) Now, open the applications tab from the menu bar. How many applications are running?
- (d) Now, open an application (Word, Excel, Power Point, or any other application) and check the process table again. What has happened to the number of processes running on the machine? What about the number of applications?

2. (8 points)

- (a) (*2 points*) Choose the performance tab from the menu bar. What is the percentage of CPU usage (utilization) on your machine right now?
- (b) (*2 points*) Now, open any application. While the application is being opened, look at the performance screen. What is the percentage of CPU usage on your machine?
- (c) (*4 points*) Comment briefly on the differences between the result from parts (a) and (b).

2 Short Answer / Multiple Choice

- 3. (1 point) Which of the following components of an operating system maintains the directory system?
 - (a) File Manager
 - (b) Memory Manager
 - (c) Scheduler
 - (d) Dispatcher
 - (e) Shell
 - (f) Device Driver
- 4. (1 point) Which of the following components of an operating system is not part of the kernel?
 - (a) File Manager
 - (b) Memory Manager
 - (c) Scheduler
 - (d) Dispatcher
 - (e) Shell
 - (f) Device Driver

5. (1 point) Multitasking in a computer with only one CPU is accomplished by a technique called
- (a) Bootstrapping
 - (b) Batch processing
 - (c) Time sharing
 - (d) Job queueing
 - (e) Load balancing
6. (1 point) Execution of an operating system is initiated by a program called the
- (a) Bootstrap
 - (b) Window Manager
 - (c) ROM
 - (d) Scheduler
 - (e) Dispatcher
7. (1 point) The end of a time slice is indicated by the occurrence of a signal called
- (a) An interrupt
 - (b) A semaphore
 - (c) A context switch
 - (d) A login
 - (e) A Huskers touchdown!
8. (2 point) What device is necessary to connect two bus networks, which both use the same communication protocol?
9. (2 points) What device is necessary to connect a ring network to a bus network?

3 Problem Solving

10. (10 points) Do problem 17 on page 142.

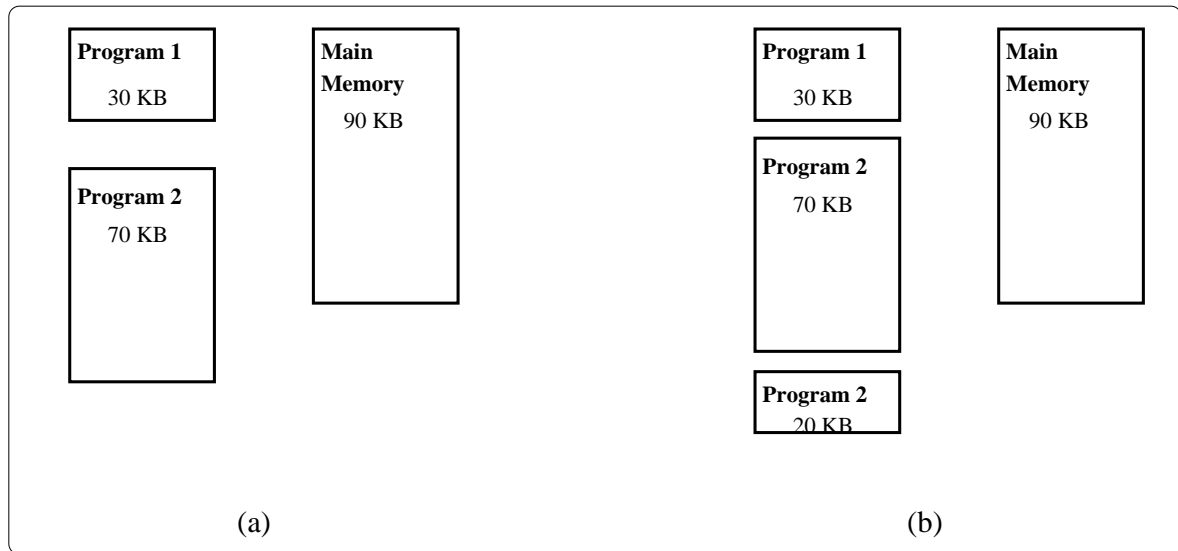
11. (10 points) Do problem 19 on page 142.

12. (10 points) Do problem 26 on page 143.

13. (10 points)

- (a) Suppose an operating system allocates time slices in 10 millisecond units and the time required for a context switch is negligible. How many processes can obtain a time slice in one second?
- (b) Discuss the trade-off between short and long time slices in a time-sharing system. Be clear and concise when answering this question. Vague answers will not receive credit!!

The next few questions emphasize the importance of virtual memory and the paging concept that are used in all computers today. Consider a system with a 90 KB main memory.



14. (12 points)

(a) Figure (a) above shows two programs, program 1 (30 KB) and program 2 (70 KB). Assume that the system does not use virtual memory. Is it possible to run the two programs on this machine at the same time? Why or why not?

(b) Show how we can use the concept of virtual memory and pages so that the two programs can run at the same time. Assume that the system uses a page of size 10 KB.

15. (6 points) Consider Figure (b). A new program has been added, program 3 (20 KB). Suppose that the system uses the concept of virtual memory and pages. Mrs. Monica, a chief engineer at *MiniSoft* Company, has suggested that the best choice of the page size in this system, given the three programs, is 20 KB. Can you give any reasons why Mrs. Monica's page size suggestion would be inefficient?

16. (6 points) Consider a network in which one of the computers in the network goes off-line (crashes). Think about how this incident affects the ability of the network to continue operating (i.e. for the remaining computers to continue communicating with each other) in the following scenarios:

- (a) The network is in a ring topology
- (b) The network is in a bus topology
- (c) The network is in a star topology and one of the outer computers crashes
- (d) The network is in a star topology and the central computer crashes

Which of the above networks (ring, bus, or star) do you think is best able to handle this occurrence? Justify your answer.

17. (4 points) How does a bridge differ from a repeater?