Gebze Technical University
Department Of Computer Engineering
CSE 312 / CSE 504

Operating Systems

Homework #04
Due May 30th 2016
Beginning of the Final Exam

In this homework, you will simulate virtual memory technique paging. You will modify your CPU

Q1.
Take 10 random numbers($r1, r2, ..., r10$) between 0 and 50. Disk requests come in to the disk driver for cylinders $r1, r2, r3, ..., r10$, in that order. A seek takes 5 msec per cylinder. How much seek time is needed for
(a) First-come, first served.
(b) Closest cylinder next.
(c) Elevator algorithm (initially moving upward).
In all cases, the arm is initially at cylinder $r5$.

Q2.
a) How much cylinder skew is needed for a 7200-RPM disk with a track-to-track seek time of 1 msec? The disk has 200 sectors of 512 bytes each on each track.
b) A disk rotates at 7200 RPM. It has 500 sectors of 512 bytes around the outer cylinder. How long does it take to read a sector?
c) Calculate the maximum data rate in bytes/sec for the disk described in the previous problem.

Q3.
A system simulates multiple clocks by chaining all pending clock requests together as shown in Fig. 5-30 in your textbook. Suppose the current time is 5000 and there are pending clock requests for time $t_1, t_2, t_3, t_4, t_5,$ and t_6 where t_i is a random number between 5001 and 5040 that you pick. You should pick numbers such that $t_i < t_{i+1}$. Show the values of Clock header, Current time, and Next signal at times 5000, and other t_i. You should show the contents of each values separarate for each time step.

Q4.
Consider the following state of a system with four processes, P1, P2, P3, and P4, and five types of resources, RS1, RS2, RS3, RS4, and RS5:

$$C = \begin{bmatrix} 0 & 1 & 1 & 1 & 2 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 2 & 1 & 0 & 0 & 0 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 1 & 0 & 2 & 1 \\ 0 & 1 & 0 & 2 & 1 \\ 0 & 2 & 0 & 3 & 1 \\ 0 & 2 & 1 & 1 & 0 \end{bmatrix}$$

$E = (24144)$

$A = (01021)$

Show that there is a deadlock in the system. Identify the processes that are deadlocked.

Q5.

A system has four processes and fiv e allocatable resources. The current allocation and maximum needs are as follows:

	Allocated	Maximum	Available
Process A	1 0 2 1 1	1 1 2 1 3	x y z t u
Process B	2 0 1 1 0	2 2 3 1 0	
Process C	1 0 0 1 0	2 2 3 1 1	
Process D	1 1 1 1 0	1 1 2 3 1	

What are the smallest values of x,y,z,t,u for which this is a safe state?

Q6.

Consider three levels/alternatives for a RAID device.
RAID 0 - data striped across all disks
RAID 1 - each disk mirrored
RAID 5 - striped parity
Assuming the RAID device has 8 disks. For each level, how much usable storage does the system receive (in terms of percentage of provided disk space)? You can assume that the IO bus has unlimited bandwidth. Show the details of your calculations.

Notes:

- This homework will be <u>handwritten</u>. No photocopies, MS Word files or PDF documents will be accepted.