Final
Jun 5, 2006 15.00–17.00
Good Luck!

Solve 10 questions.

1. What are the differences between a trap and an interrupt? What is the use of each function?

2. There are two different levels at which threads can be implemented. What are they and how do they differ? What advantages and disadvantages do each have?

3. Solve the followings;
   i. A system has two processes and three identical resources. each process needs a maximum of two resources. Is deadlock possible? Explain your answer.
   ii. Consider previous problem again, but now with **p** processes each needing a maximum of **m** resources and a total of **r** resources available. What condition must hold to make the system deadlock free?

4. For each of the following system calls, give a condition that causes it to fail: **fork** and **exec.**

5. Consider the following sets of processes, with the length of the CPU-burst time given in milliseconds. Arrival time is the time at which the process is added to the ready queue.

Process	**Burst Time**	**Arrival Time**
P1	20	0
P2	1	0
P3	6	0
P4	8	0
P5	4	8
P6	2	12

a Draw appropriate charts illustrating the execution of these processes using FCFS, SJF non-preemptive, and SJF preemptive.

b Calculate the wait times of each process for each strategy. Calculate the average wait times under each strategy.

Process	**FCFS**	**SJF-nonpremptive**	**SJF**
P1			
P2			
P3			
P4			
P5			
P6			
Average			

6. For deadlock to occur, four conditions must hold: mutual exclusion, hold and wait, no preemption, and circular wait. If any one condition does not hold, no deadlock can occur. Assume we want to allow preemption , and thus get out of deadlocks; in other words, if a deadlock is detected, we will forcibly take a lock away from a thread; by repeatedly doing this, we will eventually undo the deadlock. What new problems are introduced by this preemptive approach?

7. How does segmentation differ from paging?

8. What causes a page fault? What actions may be taken by the OS when servicing a page fault?

9. A computer uses the relocation scheme of base-limit pair. A program is 10000 bytes long and is loaded at address 40000. What values do the *base* and *limit* register get according to the scheme?

10. Estimated total average acces time in disks is given as the following formula

$$T_a = T_s + \frac{1}{2r} + \frac{b}{rN}$$

i.Describe each term in the formula

ii. The following values are given; fill the tables
$T_s = 3$ ms,
$r = 5000$rpm, At 5000 rpm, one revolution per 9ms$\Rightarrow$ average delay 4.5ms
768B sect, 480 sect/track,

1.) File stored compactly (adjacent tracks): Read first track

2.) Sectors distributed randomly over the disk: Read any sector

1.)

Average seek	
Rot. Delay	
Read 480 sectors	
Total	
All sectors	

2.)

Average seek	
Rot. Delay	
Read 1 sectors	
Total	
All	

11. Explain the UNIX index node (inode) structure in detail.

12. You are to compare reading a file using a single-threaded file server and a multithreaded server. It takes 15 msec to get a request for work, dispatch it, and do the rest of the necessary processing, assuming that the data needed are in the block cache. If a disk operation is needed, as is the case one-third of the time, an additional 75 msec is required, during which time the thread sleeps. How many requests/sec can the server handle if it is single threaded? If it is multithreaded? (Hint: 1000 msec=1 sec)