Roll Number:

Thapar University Patiala

Computer Science & Engineering Department

BE- Computer Engineering (IV Semester) CSE 27th May 2010 **CS006: Operating System**

Time: 03 Hours; MM: 40 Name of Faculty: *Shalini Batra, Vinay*

Note: Attempt any 5 Questions. Attempt all questions in SEQUENTIAL order.

Q1. (a) Table given below represents various processes along with their arrival & finish timings. (Arrival Time for Process P1 is T=0)?

q=1 → Process	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	X	X		X																
2			X		X		X			X				X				X		
3						X			X				X				X			
4								X				X				X			X	X
5											X				X					
Arrival		2		3		4		5												
Finish				1											5		3	2		4

Considering the given table for RR scheme, calculate Average Turnaround Time and Average Waiting time. Take out the two fields namely Arrival Time and CPU Burst Time from the above table for processes P_1 to P_5 and calculate the Average Turnaround Time & Waiting Time using following Algorithm:

i. FCFS ii. SJF (Preemptive) (1+1+1)

(b) What is the additional cost incurred in using a preemptive scheduling policy as opposed to a non preemptive scheduling policy? (1)

(c) When do scheduling decisions take place? (2)

(d) Explain the structure of Magnetic Disk with diagram. (2)

Q2. (a) A computer provides each process with 64K of address space divided into pages of 4K. A particular program has a text size of 32,768 bytes, a data size of 16,386 bytes, and a stack size of 15,870 bytes. Will this program fit in the address space? If the page size were 512 bytes, would it fit? Explain. (Remember that a page may not contain parts of two different segments.) (2)

(b) Explain Pagination & Segmentation in detail with diagrams. (2+2)

(c) Consider the following page reference string 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page faults would occur for LRU (Logical Clock/Time Stamping) & Optimal Page Replacement Technique assuming **FOUR** frames? (All frames are initially empty.) (2)

Q3. (a) Explain in **brief** all the disk scheduling algorithm mentioned below: (6)

i. FCFS ii. SSTF iii. SCAN iv. LOOK v. C-SCAN vi. C-LOOK

Suppose that the head of a moving-head disk with 192 tracks, numbered 0 to 191, is currently serving a request at track 80 and has just finished a request at track 62. The queue of requests is kept in the FIFO order: 119, 58, 114, 28, 111, 55, 103, 30, 75.Starting from the current head position, **Diagrammatically** represent & find the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the above mentioned disk-scheduling algorithms?

(b) Explain Access Control List & Capability List with Example. (2)

Q4. (a) Explain any two file allocation methods with diagram. (2)

(b) Explain RAID level 2 and 5 in brief with diagram. (2)

(c) Explain with reason, is it reasonable to have the following situations: (1)

(i) Physical Address Space > Virtual Address Space

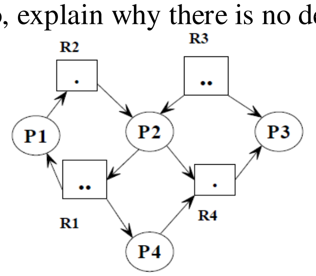
(ii) Virtual Address Space = Physical Address Space

(d) Consider the following snapshot of a system:

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	0 0 1 2	0 0 1 2	1 5 2 0
P1	1 0 0 0	1 7 5 0	
P2	1 3 3 4	2 3 5 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

i. Is the system in a safe state? Explain with reason.
ii. If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately? (1+1)

(e) Given the following Resource-allocation diagram, determine whether or not there is a deadlock. If yes, justify clearly indicating the reason. If no, explain why there is no deadlock. (1)



Q5. Write short note on: (2*4)

a) Thrashing b) Belady's Anomaly c) Virus and Worms d) Job Queue & Ready Queue

Q6. (a) In a restaurant there is a seating area for patrons with a narrow corridor (with a swing door at each end) for the waiters to gain access to the kitchens. It is so narrow that it will only allow for a waiter to go through it in one direction at a time. The manager installed a solution to the problem of collisions - a switch at each end that put a light on at the other end. If the light was on then you didn't enter the corridor. If the light was off, then you threw the switch, traveled through and then threw the switch at the other end to turn the light off. This worked fine, but yet there were still complaints with occasional accidents. The waiters complained that the system was unfair. Can you explain why there were still accidents and why the waiters complained? Can you think of how to solve this problem using a simple semaphore solution? (4)

(b) *The Cigarette-Smokers Problem*. Consider a system with three smoker processes and one agent process. Each smoker continuously rolls a cigarette and then smokes it. But to roll and smoke a cigarette, the smoker needs three ingredients: tobacco, paper, and matches. One of the smoker processes has paper, another has tobacco, and the third has matches. The agent has an infinite supply of all three materials. The agent places two of the ingredients on the table. The smoker who has the remaining ingredient then makes and smokes a cigarette, signaling the agent on completion. The agent then puts out another two of the three ingredients, and the cycle repeats. Complete the following program fragment to synchronize the agent and the smokers:

semaphore a[3] = 0; /* a[0] for tobacco, a[1] for paper, a[2] for matches */
semaphore agent = 1;
Agent(void) {
int i,j;
repeat
i = 3 * drand48( ); /* returns a random integer 0, 1 or 2 for *i* */
j = 3 * drand48( ); /* returns a random integer 0, 1 or 2 for *j* */
while (i != j) { /* *i* and *j* must be different */
the rest of it}
until false;}
Smoker(int r) { /* *r* indicates which ingredients this smoker has */
repeat
the rest of it
until false;
} (4)