Ex/CSE/T/322/85/2013

Bachelor of Computer Science & Engg. Examination, 2013

(3rd year, 2nd semester)

OPERATING SYSTEMS

Time: 3 hours

Full Marks: 100

Answer Question no.1 and any **four** from the rest

1.

a. What is turnaround time?

b. What are condition variables? Why are they used?

c. Compare the performance of SCAN and Shortest Seek Time First scheduling, assuming a uniform distribution of requests across the cylinder while requests may arrive at random.

d. How can general semaphore be implemented using binary semaphore?

e. What is protection domain? Can there be dynamic association in a domain? Justify.

f. What is inverted page table? How is it searched?

2+4+3+3+4+4

2.

a. What is response time? What is waiting time?

Consider a system with five processes as shown below with corresponding arrival time and execution time:

Process	Arrival time	Execution time
P_0	0	5
P_1	3	6
P_2	6	2
P_3	7	4
P_4	8	2

Calculate waiting time and turnaround time of each process using Shortest Remaining Time Next (SRTN) scheduling policy. Show the scheduling decisions using Gantt chart. What are the difficulties of implementing SRTN?

b. What are the differences between Multilevel Queue scheduling and Multilevel Feedback Queue scheduling? Which of these scheduling techniques is appropriate for both CPU bound jobs and I/O jobs from different categories of users in a system? Justify.

(3+8+3)+6

3.

a. Consider the following page reference during a given time interval for a memory consisting of 4 frames and 5 frames : 7, 9, 8, 0, 1, 8, 9, 7, 9, 8, 1, 2, 0, 7, 8 Using First In First Out (FIFO) page replacement strategy show the contents of memory each time a page is referenced. Compare the number of page hits for both cases. Hence comment on the respective performances.

b. How does Translation Look-aside Buffer (TLB) work? What is the effective memory access time for 97.5% TLB hit with 25 ns to search TLB and 120 ns to access main memory? What is the slowdown here?

c. Explain the concept of segmentation memory management technique. How is segmentation implemented? What would happen if reference to byte $b+k$ occurs when length of the segment is b bytes?

8+(2+2+1)+(3+3+1)

4.

a. Briefly describe the Unix kernel architecture.

b. How does Indexed File Allocation strategy work? Consider a file system using inodes for file representation. Disk blocks are 16KB and a pointer to a block requires 8 bytes. The inode contains 8 direct blocks, and a single, double and triple indirect disk blocks. What is the maximum size of a file supported by this file system?

c. How is free disk space managed using Linked List approach? What is the difference of the above-mentioned approach with Grouping approach?

d. What is the content of Access Control Matrix? An Access Control Matrix says that a process from domain X can switch to domain Y. Is this approach equivalent to including access privileges of domain Y in domain X? Why or why not?

4+(3+3)+(2+2)+(2+4)

5.

a. Briefly describe the concept of monitor.

b. Disk requests come into the disk driver for cylinders 137, 92, 56, 112, 84, 165, 48, 36, 75, 12 in that order. A seek takes 2 msec per cylinder move. What is the total seek time to access the above requests for the following disk scheduling policies: (i) First-Come First-Served (FCFS) and (ii) SCAN (disk arm moving from cylinder 0 towards cylinder 199). In all cases disk arm is initially at cylinder 78.

c. Why is Shortest Seek time First (SSTF) not a fair scheduling algorithm? What is the difference and the effect of the difference between SCAN and C-SCAN disk scheduling algorithms?

d. In which page replacement strategy Belady's anomaly may be observed? Why?

4+8+(2+3)+3

6. Ex/CSE/T/322/85/2013

a. How can circular wait condition be prevented? Is this prevention feasible? Justify.

b. Consider the following snapshot of 4 resources (R1, R2, R3, R4) in a system with 5 processes; P_0, P_1, P_2, P_3, P_4.

	Allocated				Maximum Requirement				Available			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P_0	0	1	0	1	4	2	3	2	3	3	2	2
P_1	2	1	3	2	2	4	6	1				
P_2	3	1	1	0	8	2	4	3				
P_3	2	1	1	0	2	1	2	4				
P_4	1	0	2	1	4	1	4	2				

(i) What are the further requirements of each of the processes?

(ii) Find out whether the system is in *safe* state or not. Show the working of the algorithm/s. What is the safe sequence of processes, if any, in this case?

(iii) Suppose there is request from P_2 for 2 more instance of R1 and 2 more instances of R3. Show whether this request could be granted.

(3+3)+(2+8+4)

7.

a. Distinguish between synchronous communication and asynchronous communication.

b. Suppose there are n (>1) concurrent processes. P_i will execute its code C_i at some point of time. However, it is required that the codes be executed in the sequence: C_n, C_{n-1}, .., C_2, C_1. How could this be synchronized using semaphores?

c. What is thrashing? What are the possible reasons of thrashing?

d. What information is local to a thread only? What are the different models of threading?

4+5+(2+3)+(2+4)

8.

a. Briefly describe the file system layout of Unix operating system.

b. What are the problems with Contiguous File Allocation strategy? How can the Contiguous File Allocation scheme be modified?

c. What is *race condition*? Explain with an example.

d. What is seek time? What is rotational latency?

e. What is the difference between Access Control List and Capability List?

5X4