24-11-15

INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR

B.E. 5th SEMESTER (CS) EXAMINATION, 2015

OPERATING SYSTEM (CS 502)

FULL MARKS: 70 TIME: 3 Hrs

(Answer any five)

1. (a) Which operating system components perform each of the following operations?
(i) Write to disk
(ii) Determine which process will run next
(iii) Determine where in memory a new process should be placed
(iv) Organize files on disk
(v) Enable one process to send data to another
(b) Compare the performance of FCFS and SJF type of CPU scheduling algorithm.
(c) What is the maximum waiting time of a process if the number of process in a system is N and time quantum is Q?
(d) What are the advantages of using two level directory over one level directory system?
(e) Define open system call. [5+3+1+3+2]

2. (a) Discuss the benefits and drawbacks of using multilevel paging system instead of a direct mapped paging system.
(b) Why dirty bit is maintained for a page in page table?
(c) What is the basic difference between demand paging and anticipatory paging? What is space-time product in this context? How demand paging affect degree of multiprogramming?
(d) Compare inverted page table and direct mapped page table in terms of memory efficiency and address translation efficiency.
(e) Consider a paging system with the page table stored in memory. If a memory reference takes 200 ns, how long does a paged memory reference take for flat page table, two level page table and three level page table? [2+2+1+1+2+4+2]

3. (a) Compare the performance of FCFS and SSTF disk scheduling algorithm.
(b) In which sense F-SCAN scheduling is better than the SCAN scheduling?
(c) Estimates the data transfer rate in bytes/sec of
(i) A disk with 1000 sectors per track each of 4 KB. The disk spins at 7200 rpm.
(ii) A memory bus 64 bits wide with a cycle time of 1666 nsec.
(d) Consider a disk system with 100 cylinders. The requests to access the cylinders occur in the following sequence: 4, 34, 10, 7, 19, 73, 2, 15, 6, 20.
Assuming that the head is currently at cylinder 50, what is the time taken to satisfy all requests if it takes 1 msec to move from one cylinder to adjacent one and shortest seek time first policy is used? [5+3+3+3]

4. (a) P is a set of processes. R is a set of resources. E is a set of assignment edges. Three sets P, R, and E are as follows:
P={P1, P2, P3}, R={R1, R2, R3}, E={P1→R1, P1→R2, P2→R2, P2→R3, P3→R2, P3→R3, R1→P2, R2→P2, R3→P1}
R1 has 1 instance, R2 has 2 instances, R3 has 1 instance.
(i) Draw the resource allocation graph.
(ii) Is there any deadlocked in this situation?
(b) What minimum number of additional resources are required to make the following system safe?

Process	Max	Allocated	Need	Available
P1	5	1	4	2
P2	3	1	2	
P3	10	5	5	

(c) Consider the following segment table.

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?
(i) 0, 430 (ii) 1, 10 (iii) 2, 500 (iv) 3, 400 (v) 4, 112
(d) Compare the overhead of using indexed allocation and linked allocation when the file size is less than or equal to one block. [4+3+5+2]

5. (a) The following pair of processes share a common set of variables: "Counter", "tempA", "tempB".

Process A	Process B
---	---
A1: tempA = Counter+1;	B1: tempB = Counter+2;
A2: Counter = tempA;	B2: Counter = tempB;
---	---

The initial value of the variable "Counter" is 10.
(i) What different values of the variable "Counter" are possible when both the processes have finished execution? Give an order of execution of statements from processes A and B that would yield each of the values you give.
(ii) Modify the above programs for processes A and B by adding appropriate signal and wait operations on the binary semaphore "sync" such that the only possible final value of "Counter" is 13. Indicate what should be the initial value of the semaphore "sync"?
(b) Process P1 has declared a service time of 5 secs and has been waiting for 20 secs. Process P2 has declared a service time of 3 secs and has been waiting for 9 secs. If the system uses highest response ratio next scheduling, which process will execute first?
(c) Describe the differences between short, long and medium term scheduling? [6+2+6]

6. (a) What is thrashing? What is the effect of thrashing over CPU utilization and degree of multiprogramming?
(b) Why PFF has low overhead than working set model?
(c) What is the difficulty of LRU page replacement strategy? How it is solved in NUR page replacement strategy?
(d) What is file descriptor? [2+3+2+5+2]

7. Discuss about the followings:
(a) Hard link vs. Soft link
(b) File system mounting
(c) Process control block
(d) RAM disk vs. Disc cache
(e) Access list vs. Capability list [3+2+4+2+3]