2014

Operating System

Time Alloted : 3 Hours   **Full Marks : 70**

The figure in the margin indicate full marks.
Candidates are required to give their answers in their
own words as far as practicable

GROUP - A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following questions.

    10x1=10

    i) Which of the following is false?

    i) Segmentation suffers from external fragmentation

    ii) Paging suffers from internal fragmentation

    iii) Virtual memory is used only in multiuser system

    iv) Segmented memory can be paged

    ii) Thrashing

    i) Reduces page I/O

    ii) Decreases the degree of multiprogramming

    iii) Implies excessive I/O

    iv) Improves the system performance

iii) RAID configuration disks are used to provide

    i) Fault tolerance

    ii) Nearest cylinder next

    iii) High data intensity

    iv) Low data intensity

iv) Which of the following page replacement algorithms suffer from Belady's anomaly?

    i) OPT

    ii) LRU

    iii) FIFO

    iv) Both I) and ii)

v) Virtual memory concept is supported by

    i) Demand paging

    ii) Simple segmentation

    iii) Any dynamic memory allocation

    iv) Paged segmentation

vi) The short-term scheduler is responsible for:

    i) selecting the shortest jobs to enter the system

    ii) Discarding job groups that should be removed from the system

    iii) Selecting which process should be allocated to the CPU next

    iv) Swapping jobs out of memory

    v) None of the above.

vii) The average wait time for five processes PI-P5 with burst of 5, 19,2,16 and 7 milleseconds respectively, using SJF is :

    i) 5 milliseconds

    ii) 10.6 milliseconds ✓

    iii) 28.25 milliseconds

    iv) 9.8 milliseconds

    v) none of the above.

viii) Suppose that the operating system is running a non-preemptive scheduler and that process p is currently running. A context switch can occur:

    i) When p terminates or blocks. ✓

    ii) When another process unblocks.

    iii) When another process enters.

    iv) When the time quantum is exhausted.

    v) When the priority of some other process exceeds the priority of p.

ix) A situation where several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which access takes place is called:

    i) data consistency

    ii) race condition ✓

    iii) aging

    v) Starvation

x) The segment of code in which the process may change common variables, update tables, write into files is known as:

    i) Program

    ii) critical section ✓

    iii) non - critical section

    iv) synchronizing

GROUP - B

(Short Answer Type Questions)
Answer any *three* of the following.   3x5=15

2. What is Direct Memory Access (DMA)? How is it performed? What are its benefits.

    (1+2+2)

3. What is the cause of thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system do to eliminate this problem?

    Given memory partitions of 100 KB, 500 KB, 300 Kb, and 600 KB (in order)

    (5+5)

4. How would each of the First Fit, Best Fit, Worst Fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order). Which algorithm makes the most efficient use of memory?

5. Give details of how paging is implemented in hardware. What is a TLB and how is it implemented?

6. What is context switching? Why is it considered to be an overhead? What are the differences between process and thread?

(2+1+2=5)

GROUP - C

(Long Answer Type Questions)
Answer any *three* of the following.   3x15=45

7. What resources are used when a thread created? How do they differ from those when a process is created? What is virtual memory? What is fragmentation? Explain different types of fragmentation. Which one may occur in paging system?

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

8. a.) What is swapping? What is its purpose?

b.) Consider the following sequence of memory references generated by a single process in a pure paging system: 10 11 104 104 170 173 177 309 245 246 247 258 264. Determine the number of page faults for each of the following page replacement algorithms assuming three (3) page frames are available and all are initially empty The size of a page is 100 words:

      i) LRU

      ii) FIFO

      iii) Optimal page replacement

c). Explain with diagram different File Allocation methods. Suppose a disk has size 128 GB, and blocks are of size 64 KB. If all block numbers are stored as 4-byte integers, how large must

a main-memory file-allocation table(FAT) be?

(4+6+3+2)

9. a) Write down the four necessary conditions of deadlock.

b) What is banker's safety algorithm?

Process	Current Allocation				Maximum Allocation				Available			
P1	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P2	0	0	1	2	0	0	1	2	2	1	0	0
P3	2	0	0	0	2	7	5	0				
P4	2	3	5	4	4	3	5	6				
P5	0	3	3	2	0	6	5	2				

c) Is this system currently in a safe state justifying your answer?

If a request from P3 arrives for (0, 1,0,0) can that request be safely granted immediately. Differentiate between deadlock and starvation.

(5+5+5)

10. a) What is boot strapping? Distinguish between multiprogramming and multithreading OS? State the function of batch processing system.

b) "All unsafe states may not lead to deadlock" why or why not? Define the critical section and identify the requirements to be satisfied to solve the critical section problem.

c) Discuss dinning philosopher problem with the solution.

(1+2+2)+(3+2)+5

11. a) What is semaphore? How is it used to overcome critical section problem?

b) How mutual exclusion, hold & wait and circular wait are different from each other?

Explain with an example. Explain different types of thread.

c) How does the monitor give the solution for synchronization problem? What is binary semaphore?

$$(2.5+2.5)+(2+1+2)+(3+2)$$

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