प्रज्ञानं ब्रह्म

Manipal
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MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

FOURTH SEMESTER B.TECH.(CCE) DEGREE MAKEUP EXAMINATION JUNE/JULY 2016

SUBJECT: OPERATING SYSTEMS (ICT 2251)

(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **28/06/2016** **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data, if any, may be suitably assumed.

1A. Assume you have the following jobs to execute with one processor, with the jobs arriving in the order and time listed and the execution time as shown in Table Q.1A

Table Q.1A.

Process No.	Execution Time(ms)	Arrival Time(ms)
1	53	4
2	17	2
3	68	3
4	24	1

Calculate the waiting time, turnaround time for each of these processes using FCFS, Shortest Job non-preemptive scheduling algorithm and Round Robin algorithm (time quantum = 10 ms.)

1B. Solve the readers–writers problem using monitors and explain.

1C. What is critical section problem? How does a semaphore solve the critical section problem?

[5+3+2]

2A. What is paging? How is it different from contiguous memory allocation? Explain with the help of supporting hardware diagram how the TLB improves the performance of a demand paging system.

2B. Consider a paging system with the page table stored in memory.

i. If a memory reference takes 170 milliseconds, how long does a paged memory reference take?

ii. If we add associative register and 75 percentage of all page table references are found in the associative registers, what is the effective memory access time if two level paging is used? (Assume that finding a page table entry in the associative memory/registers takes 50 nanoseconds time).

2C. Consider a machine with 64 MB physical memory and a 32-bit virtual address space. If the page size is 4KB, calculate the approximate size of the page table?

[5+3+2]

3A. Consider the following snapshot of a system with five processes (P1, ...,P5) and four resources (R1, ...,R4). Currently available resources for R1,R2,R3,R4 are 2,1,0,0 respectively. Current allocation matrix C:P1 [0 0 1 2]; P2 [2 0 0 0]; P3 [0 0 3 4]; P4 [2 3 5 4]; P5 [0 3 3 2]; Maximum requirement matrix R: P1 [0 0 1 2]; P2 [2 7 5 0]; P3 [6 6 5 6]; P4 [4 3 5 6]; P5 [0 6 5 2].

i. Compute what each process needs.

ii. Is this system currently safe? Use Banker's algorithm to support your answer.

iii. If a request from P3 arrives for (0, 1, 0, 0), can that request be safely granted immediately? Which processes, if any, may become deadlocked if this whole request is granted immediately?

3B. Consider the following sequence of memory references for a program of page size 1KB: 5 2 4 1 2 0 5 0 6 8 2 4 3 5 1 7 2 8 2. If 3 KB of primary memory is allocated to this program, calculate the number of page faults for FIFO, LRU and optimized page replacement algorithms.

3C. Distinguish between internal and external fragmentation. Which fragmentation is observed if any in paging technique? Explain. [5+3+2]

4A. Suppose a disk drive has 5000 cylinders numbered 0 to 4999. Drive is currently serving request at cylinder 143, and the previous request was at cylinder 125, queue of pending request in FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending request for FCFS, SSTF, LOOK, SCAN disk scheduling algorithms.

4B. Distinguish between user threads and kernel threads. Discuss any four threading issues.

4C. What is segmentation? How is it different from paging? How is the mapping form logical to physical address done in segmentation technique? [5+3+2]

5A. A cyclic real-time scheduler is to be used to schedule three periodic tasks T1, T2, and T3 with the following characteristics:

Task	Phase mSec	Execution Time mSec	Relative Deadline mSec	Period mSec
T_1	0	20	100	100
T_2	0	20	80	80
T_3	0	30	150	150

Suggest a suitable frame size that can be used. Show all intermediate steps in your calculations. Determine whether the task set is schedulable. If yes, schedule these tasks using EDF approach.

5B. Identify the key differences between hard real-time, soft real-time, and firm real time systems. Give at least one example of real-time tasks corresponding to these three categories.

5C. With a neat diagram, explain the various states a real time task undergoes. [5+3+2]