

Operating Systems

Final-Term Theory Exam, R22

BSCS

Time Allowed: 150 minutes Total Marks: 50

Instructions

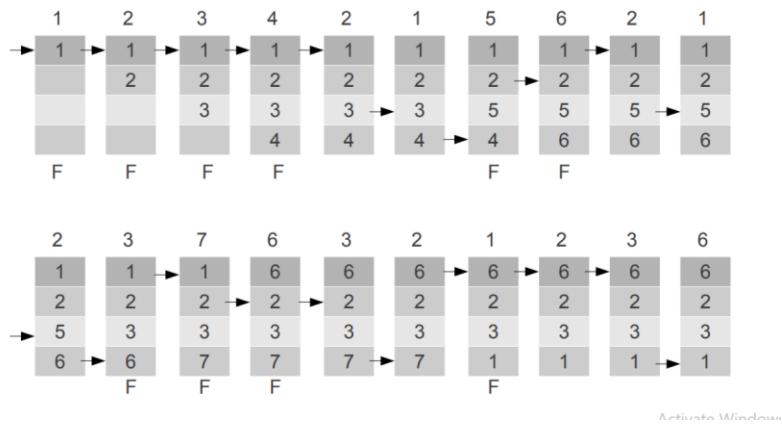
- Attempt all questions.
 - Understanding the problem is part of the problem.
 - There is no mistake in the question paper. If you find any, make a sensible assumption and solve the paper.
 - Scientific calculator is allowed.
 - Do NOT write anything other than your name and registration number on question paper.
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Question#1 (10 points)

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 the LRU replacement algorithm, assuming four frames? Remember that all frames are initially empty, so your first unique pages will cost one fault each.



Question#2 (7+3 points)

1. A 32-bit program can have maximum of 16K pages on a machine having 33-bit usable physical address bus. Calculate the following with correct units.
 - a) Size of p field 14 bits
 - b) Size of d field 18 bits
 - c) Size of f field 15 bits
 - d) Page Size 256 k
 - e) Size of logical address 32 bits
 - f) Number of frames 32 k

- g) RAM size 8GB
2. if main memory access time is 400 microseconds, TLB access time is 50 microseconds, considering TLB hit as 90% what will be the overall access time?

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Question#3 (3+3+4 points)

Answer the following questions precisely. Your answer to each question must not exceed 4 lines.

1. To maintain relationship between kernel and user threads explain the multithreading models.

Many to One Model

One to One Model

Many to Many Model

2. What are the conditions must be fulfilled by the solution of critical section problem?

Mutual Exclusion

If process Pi is executing in its critical section, then no other processes can be executing in their critical sections

Progress

Thread and/Process running in their remainder section should not participate in decision making

Decision making should be indefinitely prolonged (timely manner)

If no process is executing in its critical section and there exist some processes that wish to enter their critical section, then the selection of the processes that will enter the critical section next cannot be postponed indefinitely

Bounded Waiting

A bound must exist on the number of times that other processes are allowed to enter their critical sections after a process has made a request to enter its critical section and before that request is granted

Assume that each process executes at a nonzero speed

No assumption concerning relative speed of the n processes

3. What is Starvation and Deadlock?

Starvation (due to bounded waiting violation)

Deadlock (due to Progress violation)

Question#4 (5x2 points)

Choose the best suitable option for following conditions. Negative marking applies to this question.

Parent and Child	zombie	init	orphan
Parent terminated before calling wait () and child is called			X
Child terminated before parent call wait()	X		
Parent of process is assigned when its own parent is killed		X	
Parent of all processes is		X	
The process has no parents		X	

Question#5 (10 points)

Passengers come to a bus stop and wait for a bus. Write synchronization code for them that enforces the following constraints.

- When the bus arrives, all the waiting passenger invoke boardBus (), but anyone who arrives while the bus is boarding must wait for the next bus.
- The capacity of the bus is 50 people and 30 seats are reserved for female; if there are more than 50 people (more than 30 female or 20 male) waiting, some will have to wait for the next bus.
- When all the waiting passengers have boarded, the bus can invoke depart (). If the bus arrives when there are no passengers, it should depart immediately.

Best of Luck