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REVIEW for FINAL EXAM

This is for the case when the exam will be in person (I'll email students in case it will be online which then will be open books, the scope then will be all topics in this semester).

1. Exam Date, Time, Location

▶ Will be in our classroom. See the final exam date & time in our schedule and syllabus.

2. Exam Format

- Similar to the Exam-1 and Exam 2.
- Closed books, no devices.
- > There will be 20 questions, some are essays, drawing diagrams, or multiple-choice (see below).

3. Exam Scope

➢ All lectures, accumulated.

4. How to Prepare?

Read the textbook. Review my lecture notes/slides posted on our class website. Pay special attention to the **outline** (page #2) and summary page (usually page #3) in each lecture note which lists **important keywords** and **review questions**.

Must know:

- Process states/queues/schedulers
- CPU scheduling methods: FIFO, SJF, Preemptive SJF, Priority, Preemptive Priority, Round Robin
- DMA, physical memory, logical memory, virtual memory, fragmentations
- Memory allocation methods: FF, BF, WF
- Memory organizing schemas/methods: Paging, Segmentation
- Translate a logical address to a physical address with paging or with segmentation
- Disk scheduling methods: FCFS, SSTF, SCAN, C-SCAN, C-LOOK
- Deadlock, thrashing, threads
- Life cycle of an I/O request, interrupt-driven I/O cycle
- Page replacement methods: FCFS, Optimal, LRU, MRU, LFU, MFU
- Allocation of frames, valid/invalid bit, prepaging, working-set model
- File allocation methods: Contiguous, Linked, Index
- Protection access matrix
- OSI (7-layer) network model
- Message Encapsulation (5-layer) for hosts, routers, and switches

5. EXAMPLES of QUESTIONS

Please ALSO see the examples of questions listed in the reviews for exam 1 and exam 2.

Examples of multiple-choice questions:

1)

Which of the following programs runs all the time on the computer?

- A) compiler
- B) assembler
- C) text editor
- D) kernel

Ans: D

Explanation: only kernel automatically is loaded and stays in the RAM, other programs are loaded ONLY when they are called and will be deleted from the RAM when they are done.

Which of the following is NOT secondary storage device?

- A) random access memory
- B) solid state disks
- C) optical disk
- D) magnetic tape

Ans: A

Explanation: (A) is RAM which is the primary storage device not secondary, others (B,C,D) are different kinds of secondary storage devices

2)

Which of the following is the fastest interprocess communication mechanism?

- A) message passing
- B) shared memory
- C) socket communication
- D) two-phase commit protocol

Ans: B

Which of the following is not an operating system service?

- A) program execution
- B) I/O operation
- C) protection and security
- D) OS graphical user interface

Ans: D

Examples of essay questions:

3) Explain what is DMA and why we need it?

ANSWER: DMA is direct memory access, which is a mechanism in computer systems where some I/O devices can transfer data to/from RAM without having the CPU involved during the whole transfer.

4) Given this reference string (queue): 7,0,1,2,0,3,0,4,2,3,0,3,0,3,2,1,2,0,1,7,0,1 and that the memory has 3 frames. Show the allocation of pages in the queue step by step using **FCFS page replacement method**. Define whether there is a page fault or not for each step and calculate the total number of page faults for this queue.

reference string



TOTAL = 15 page faults

5) Given this reference string (queue): 7,0,1,2,0,3,0,4,2,3,0,3,0,3,2,1,2,0,1,7,0,1 and that the memory has 3 frames. Show the allocation of pages in the queue step by step using **Optimal page replacement method**. Define whether there is a page fault or not for each step and calculate the total number of page faults for this queue.

re	fere	nce	strin	g																
	7	0	1	2	0	3	0	4	2	3	0	3	2	1	2	0	1	7	0	1
	7	7	7	7 0 1	2 0 1	:	2 0 3		2 4 3		2	2 0 3		(2 D			: (7 D 1	
	bage	e frar	nes																	

TOTAL = 9 page faults

6) Do we have a deadlock in the following situation? Explain why.

ANSWER: Yes, the deadlock is formed by T1,R1,T2,R3,T3,R2 as processes/tasks T1,T2,T3 will have to wait forever for resources currently held by each other.



7) Given the following access policy:
D1: <F1, {read}>, <F3, {read}>
D2: <printer, {print}>
D3: <F2, {read}>, <F3, {execute}>
D4: <F1, {read,write}>, <F3, {read,write}>

Draw the access matrix for these policy.

ANSWER:

object domain	F ₁	F ₂	F ₃	printer
<i>D</i> ₁	read		read	
<i>D</i> ₂				print
D ₃		read	execute	
<i>D</i> ₄	read write		read write	

8) Given the following access matrix:

object domain	F ₁	F ₂	F ₃	printer
<i>D</i> ₁	read		read	
D ₂				print
<i>D</i> ₃		read	execute	
<i>D</i> ₄	read write		read write	

Write its access policy.

ANSWER:

D1: <F1, {read}>, <F3, {read}> D2: <printer, {print}> D3: <F2, {read}>, <F3, {execute}> D4: <F1, {read,write}>, <F3, {read,write}>

Examples of Draw-Diagram questions:



9) Draw a diagram to explain the Interrupt-Driven I/O Cycle

10) Draw a diagram to explain how the Linked File Allocation Method works.

