



Review for Final Exam

Lecture 39

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CS241 Final Exam Statistics

- Date: May 8, 8-11am
- Rooms:
 - SC 1404 – for students with last name starting letters A-P
 - SC 1105 – for students with last name starting letter S
 - SC 1302 – for students with last name starting letters R, T, V
 - SC 1304 – for students with last name starting letters W-Z
 - Space is limited, make sure you go to the right room
- Grading Policy: 30% for final exam
- Bring your student ID
- No calculators, no cell-phones, no other electronic devices allowed during the final exam
- Exam is Closed Book, Closed Notes

Conflict Exam

Only upon **Request**

Email klara@cs.uiuc.edu for conflict exam
schedule

To Do List

Make Sure Your Grades are up to date (LMP2, LPM3 grades) - Check Compass

Finish HW2, Wednesday, 5/2, 4pm

Make sure you can answer HW1+HW2

Make sure you can answer all quizzes

Make sure you can answer most of the Shadow HW problems

READ R&R and Stallings Books

SET YOUR ALARM CLOCK!!!

Final Exam Topics

Queuing Theory

Stallings, Chapter 9, pp. 428-433

Lecture Notes, Lecture 20

Deadlock (Conditions and Handling)

Stallings, Chapter 6.1-6.4, pp. 256-274

Lectures Notes, Lectures 21-22

I/O Devices (DMA, disk characteristics, I/O performance)

Stallings, Chapter 11.1-11.5, pp. 482-496 (up to disk scheduling policies)

Lecture Notes, Lectures 23, 38

Final Exam Topics

File Systems (API, abstractions, allocation, inodes, space management, access, special files)

Stallings, Chapter 12.1-2.7, pp. 536-565

R&R, Chapter 4.1-4.8

R&R, Chapter 5.1-5.4

Lecture Notes, Lectures 24-27

Memory Management (binding, allocation policies)

Stallings, Chapter 7.1-7.3, pp. 303-320

Lecture Notes, Lectures 28-29

Final Exam Topics

Virtual Memory Management (hardware – TLB, paging, replacement policies, thrashing)

Stallings, Chapter 8.1-8.2, pp. 333-371

Lecture Notes, Lectures 30-33

Networking (sockets, TCP/IP, UDP/IP, client/server paradigm, naming, RPC)

Stallings, Chapter 13.1-13.3, pp. 582-595

Stallings, Chapter 14.3, pp. 621-625

R&R, Chapter 18.1-18.3, 18.7-18.8

Lecture Notes, Lectures 34-37

Final Exam Format

Multiple Choice Questions – 20%

Algorithmic Questions – 20%

Calculation Questions – 5-10%

Implementation Questions – 20-30%

Comparison Questions – 10-20%

Explanation/Justification Questions – 10-20%

Definition Questions – 5-10%

Algorithmic Question (10 Points)

Consider six processes P1, P2, P3, P4, P5, P6, and four resources R1, R2, R3, R4.

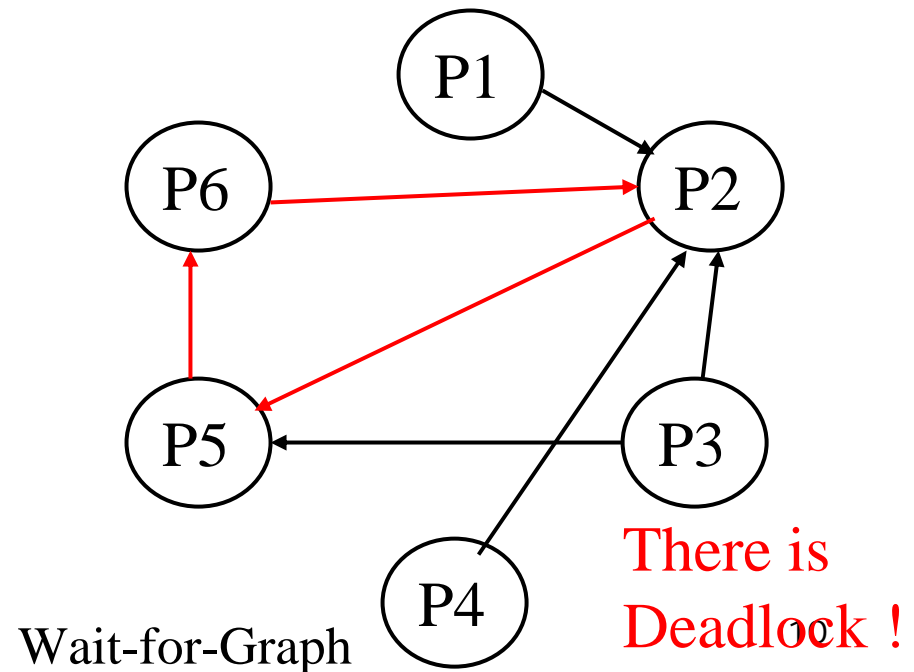
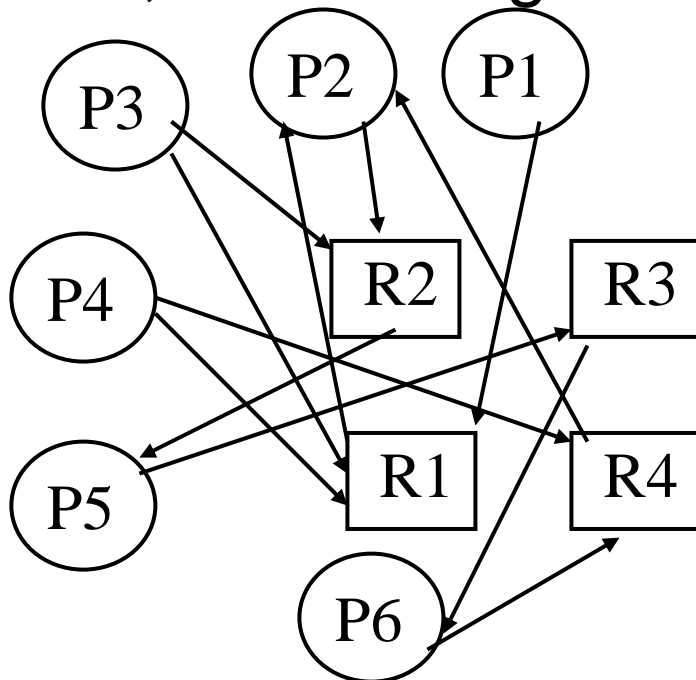
Consider the following resource requests and allocations among the processes and resources:

P1 requests R1, R1 is assigned to P2, P3 requests R1, P3 requests R2, P2 requests R2, R2 is assigned to P5, P4 requests R1, R3 is assigned to P6, P5 requests R3, P4 requests R4, R4 is assigned to P2, and P6 requests R4.

Question: Construct a wait-for-graph from the set of resource requests and assignments. Do these resource requests and assignments yield a deadlock?

Algorithmic Question - Answer

P1 requests R1, R1 is assigned to P2, P3 requests R1, P3 requests R2, P2 requests R2, R2 is assigned to P5, P4 requests R1, R3 is assigned to P6, P5 requests R3, P4 requests R4, R4 is assigned to P2, and P6 requests R4.



Wait-for-Graph

Resource-Allocation-Graph

Calculation Question – 5 Points

Consider 32-bit Architecture with page size of $8192=2^{13}$ bytes. Consider two-level paging.

1. How many bits are allocated in the virtual address for offset?
2. How many bits are allocated in the virtual address for the directory of page tables?
3. Consider the virtual address in decimal representation 10,456. What is the page number and offset for this virtual address?

Calculation Question – 5 Points

Consider 32-bit Architecture with page size of $8192=2^{13}$ bytes.
Consider two-level paging.

1. How many bits are allocated in the virtual address for offset?

A. 13 bits – number of bits needed for offset (since the page size is 8192, so offset is between 0 and 8191)

2. How many bits are allocated in the virtual address for the directory of page tables?

A: $8192/4 = 2048$ number of addresses, where $2048=2^{11}$. Hence, we need for page of page tables 11 bits. Hence for directory of page tables we need $32 - 11 - 13 = 8$ bits;

3. Consider the virtual address in decimal representation 10,456. What is the virtual page number and offset for this virtual address?

$10,456/8,192 = 1$ page and offset 2,264.

Implementation Question – 10 Points

Consider the following code:

```
char *hostn = "cs.uiuc.edu";
struct hostent *hp;
struct sockaddr_in server;

if ((hp=gethostbyname(hostn)) == NULL)
    fprintf(stderr, "Failed to resolve host name\n");
else
    memcpy((char *)&server.sin_addr.s_addr,
           hp->h_addr_list[0], hp->h_length);
```

Use the struct hostent returned from 'gethostbyname' code to output a list of aliases for cs.uiuc.edu

```
struct hostent {
    char *h_name;
    char **h_aliases;
    int h_addrtype;
    int h_length;
    char **h_addr_list;
};
```

Implementation Question – Answer

Use the pointer 'hp' to struct hostent returned from 'gethostbyname' code to output a list of aliases for "cs.uiuc.edu"

```
struct hostent {  
    char    *h_name;  
    char    **h_aliases;  
    int     h_addrtype;  
    int     h_length;  
    char    **h_addr_list;  
};  
A: char **q;
```

```
for (q=hp->h_aliases; *q != NULL; q++)  
    printf("%s \n", *q);
```

Comparison Question – 6 Points

Name one advantage of hard links over symbolic links and one advantage of symbolic links over hard links

Comparison Question – Answer

Name one advantage of hard links over symbolic links and one advantage of symbolic links over hard links

A: Advantage of hard link over symbolic link: Hard links do not require extra disk space, just a counter in the i-node to keep track of how many there are. Symbolic links need space to store the name of the file pointed to.

A: Advantage of symbolic link over hard link: Symbolic link can point to files on other machines, even over the Internet. Hard links are restricted to pointing to files within their own partition.

Explanation Question (10 Points)

Consider resources such as CPU, memory, disk.

1. Is it possible to have a deadlock involving these resources?
2. If it is, how could such a deadlock occur?
3. What deadlock scheme would seem best to eliminate these deadlocks or what condition would need to be violated to break the deadlock.
4. If deadlock cannot occur, why not? Explain clearly the reason.

Explanation Question - Answer

1. **Is it possible to have a deadlock involving these resources?**

A: Yes, it is possible to have deadlock with resources such as CPU, memory, disk. For example, if process P1 holds CPU, and waits for memory, process P2 holds memory and waits for disk, and process P3 holds disk and waits for CPU, then we have deadlock.

2. **If it is, how could such a deadlock occur?**

A. Deadlock occurs due to circular wait of processes on resources.

3. **What deadlock scheme would seem best to eliminate these deadlocks or what condition would need to be violated to break the deadlock.**

A. One condition to violate is “no preemption” condition for deadlock. It means, we need preemptive scheduling with time slicing for CPU, and memory paging/swapping preemptive mechanisms.

4. **If deadlock cannot occur, why not? Explain clearly the reason.**

A. Deadlock can occur.

Definition Questions – 5 Points

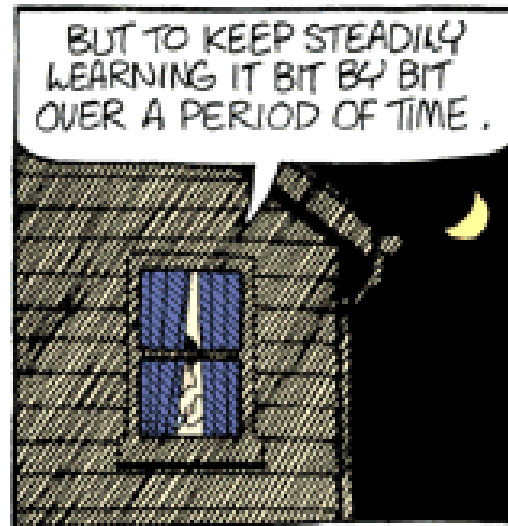
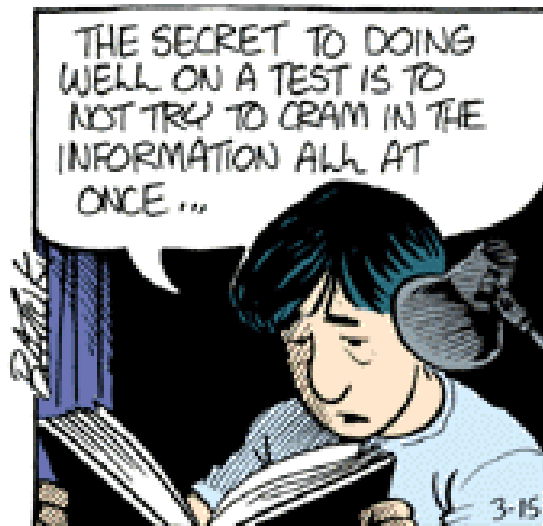
What elements are typically found in a page table entry? Briefly define at least three elements.

Definition Questions – Answer

What elements are typically found in a page table entry? Briefly define each element.

- A: 1. Frame Number - each virtual page number (index of the page table) will be mapped to a physical frame number which assists when calculating the physical address
2. Control Bits
- a. Present/Valid Bit – indicates whether the corresponding page is present in main memory
 - b. Modify (Dirty) Bit – indicates whether the page was modified/written to since the page was last loaded into main memory.
 - c. Reference Bit – indicates whether the corresponding page was accessed in the previous round
 - d. Read Bit – indicates whether the page can be read
 - e. Write Bit – indicates whether the page can be written into

How to take a Final



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Studying for Exams

<http://www.cse.buffalo.edu/~rapaport/howtostudy.html#examtime>

Make a schedule. Put the same effort into studying for each exam

Make a study outline for each subject

- Use highlighter

- Reduce course facts to 1-2 sheets of paper

Write sample essays and do sample problems

- Form a study group

Make Flash Cards (use paper)

Study until confident

Take Exams



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<http://www.cs.uiuc.edu/class/sp07/cs411/resources/>

Multiple Choice

To prepare for a multiple choice exam, consider the following steps:

Begin studying early

Multiple choice exams tend to focus on details, and you cannot retain many details effectively in short-term memory. If you learn a little bit each day and allow plenty of time for repeated reviews, you will build a much more reliable long-term memory.

Make sure that you identify and **understand thoroughly everything that your instructor emphasized in class.**

Pay particular attention to fundamental terms and concepts that describe important events or features, or that tie related ideas and observations together. These are the items that most commonly appear on multiple choice exams.

Multiple Choice

As you study your class notes and your assigned readings, **make lists and tables.**

Concentrate on understanding multi-step processes, and on ideas, events, or objects that form natural sequences or groupings. Look for similarities and differences that might be used to distinguish correct choices from distractors on an exam.

If your textbook highlights new vocabulary or key definitions, be sure that you understand them. Check to be sure that you have not left any out by mistake. *Do not simply memorize the book's definitions. Most instructors will rephrase things in their own words as they write exam questions, so you must be sure that you really know what the definitions mean.*

Brainstorm possible questions with several other students who are also taking the course.

Practice on sample questions, if you have access to a study guide or old exams.

Answering Multiple Choice Questions

There are many strategies for maximizing your success on multiple choice exams.

The best way to improve your chances, of course, is to study carefully before the exam.

There is no good substitute for knowing the right answer.

Even a well-prepared student can make silly mistakes on a multiple choice exam, however, or can fall prey to distractors that look very similar to the correct answer.

Tips to help reduce perils:

Before you begin taking the exam, enter all pieces of required information on your answer sheet

If you are so eager to start that you forget to enter your name and ID number, your results may never be scored. Remember: your instructor will not be able to identify you by handwriting or similar text clues.

Always cover up the possible responses with a piece of paper or with your hand while you read the *stem*, or body of the question.

Try to anticipate the correct response before you are distracted by seeing the options that your instructor has provided. Then, uncover the responses.

If you see the response that you anticipated, circle it and then check to be sure that none of the other responses is better.

If you do not see a response that you expected, then consider some of the following strategies to eliminate responses that are probably wrong.

None of these strategies is infallible.

A smart instructor will avoid writing questions for which these strategies work, but you can always hope for a lapse of attention.

Responses that use absolute words, such as "always" or "never" are less likely to be correct than ones that use conditional words like "usually" or "probably."

"Funny" responses are usually wrong.

"All of the above" is often a correct response. If you can verify that more than one of the other responses is probably correct, then choose "all of the above."

"None of the above" is usually an incorrect response, but this is less reliable than the "all of the above" rule. Be very careful not to be trapped by double negatives.

Look for grammatical clues. If the stem ends with the indefinite article "an," for example, then the correct response probably begins with a vowel.

The longest response is often the correct one, because the instructor tends to load it with qualifying adjectives or phrases.

None of these strategies is infallible.

If all else fails, choose response (b) or (c). Many instructors subconsciously feel that the correct answer is "hidden" better if it is surrounded by distractors. Response (a) is usually least likely to be the correct one.

If you cannot answer a question within a minute or less, skip it and plan to come back later. Transfer all responses to the answer sheet at the same time, once you have marked all questions on your exam. (If you try to do several things at once, you increase the probability of making a mistake. Saving the relatively mindless job of filling in bubbles until the last step reduces the probability of making silly errors.)

Be sure that you have filled the appropriate bubbles carefully **IN PENCIL**.

Your instructor will probably never take a close look at your answer sheet, so if you fail to fill in bubbles completely or if you make stray marks, only the computer will notice, and you will be penalized. Erase any accidental marks completely.

Take the time to check your work before you hand in the answer sheet.

Unlike an essay exam, on which you may later appeal a grade on the grounds that the instructor misunderstood your response, a multiple choice exam offers you no opportunity for "partial credit." If you filled the wrong bubble, your answer is 100% wrong.

