The Bellenot's COP 4611 - 02 Intro to Op Sys
office 218 Love office hours 12:30 - 1:15 M-F
the good doctor is around most afternoon's

Text: Peterson & Silberschatz: Op Sys Concepts
Coverage: We will attempt to cover the entire text.

Software Project: 50% of your grade will be based on a team software project. This project will have multiple due dates and will be extensively outlined in class.

Tests: 1. A midterm (10% of grade) on
2. A final (30% of grade) on

Homework: Assigned weekly on Wed and due the next wed. Usually two problems often from the text. Grade on a 0-10 basis, only the top 90% count toward the 10% of your grade. The instructor will mark these according to neatness and clarity of expression as well as for correctness.

Grades: The classic 90, 80, 70, 60 for A, B, C, D modified by allowdy 68 for a C since it is a senoir level course.

HW1: due Wed 15 Jan 86 Probs 1.5, 1.11 pp35-36 Text.

COP 4611-01 FINAL
OP SYSTEMS

single user _____
user (SS) no. _____
password _____

Welcome to BATCH mode: Next Scheduled Down Time 2:30 pm

1. S is a semaphore. In A & B describe what the operations (10pt) due to the value and queue of S

A. WAIT(S):

B. SIGNAL(S):

C. What is the relationship between the value of S and the number of processes waiting in S's queue? (two cases)

2. Consider the following state transitions.
(10pt) (1) job-pool → ready (2) running → ready
(3) ready → running (4) running → job-pool
(5) ready → suspended_ready (6) ready → job-pool
(7) coblocked → ready (8) suspended_ready → ready

A. Which transitions are not allowed _____
B. Which transitions are caused by interrupts _____
C. The long term scheduler controls transitions _____
D. The short term scheduler controls transitions _____
E. "The swapper" controls transitions _____

3. In almost all units FIFO or FCFS is almost always an alternative.
(12pt) A. Give three (3) advantages to FIFO:

B. For each unit below give a disadvantage to FIFO
1. Job scheduling:

2. Disk scheduling:

3. Page replacement:

/32

4. (15pt) The processes to the right are listed with both burst and arrival time. Complete the Gantt charts for the following scheduling algorithms and compute the average wait time

JOB	Burst Time	Arrival Time
A	16	0
B	8	1
C	2	3

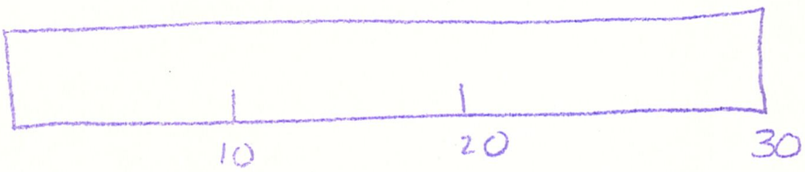
A FIFO

aver wait _____

B. SJF (Shortest Job first)

aver wait _____

C SRTF (Shortest remaining time first — pre-emptive)



aver wait _____

5. (20pt) Put T (true) or F (false) in the squares depending on the directory structure and statements below

Directory Structure	A	B	C	D	E	F	G	H	I	J
Single-level										
Two-level										
Tree Structured										
Acyclic Directories										

A. Two different users can have a file named DATA.
B. A user can have two files named DATA
C. Has a link count field for each file
D. Requires garbage collection to clean up files that no longer have a directory reference.
E. Is used on the Cyber
F. Each file has at least one path name
G. A user can have one file named both DATA and ADA
H. Is used in UNIX
I. Is used in CPM
J. Is used in VMS

6. Explain or Define: (3 ea)

A. Thrashing

B. Seek Time

C. Polling

D. Critical Section

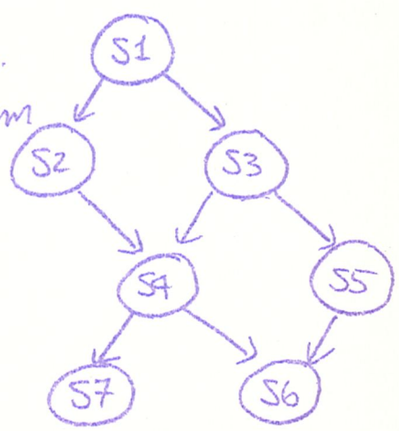
E. Token Passing

F. Transfer time

G. Working Set

H. Latency time

7. (10pt) Consider precedence graph to the right. Show how to write a corresponding program using semaphores and parbegin - parend Initialize all semaphores.



8. Compare & Contrast (4 pt ea)

A. Virtual vs Transparent

B. Deadlock vs Starvation

C. Local vs Global Page replacement

D. Segments vs Pages

E. Absolute vs Relocatable

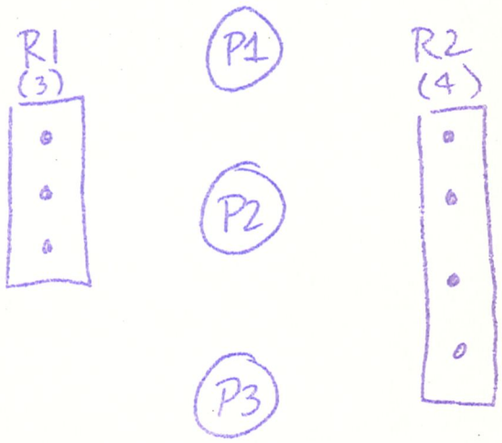
9. (16pt)

A. Complete the resource allocation graph from the info to right.

	ALLOC		REQU		MAX	
	R1	R2	R1	R2	R1	R2
P1	1	1	1	0	3	1
P2	1	1	1	1	2	4
P3	0	1	0	1	0	3

B. Show that the system is not deadlocked. Give two sequences which processes can be completed.

C. Is the system safe or unsafe (in the sense of Banker's Algorithm)



D. One of the resources in R1 fails how does this change things?

E. Another process P4 enters the system, if the system was in a safe state before P4 entered can it change to an unsafe state? Why?

10. Arithematic

(14pt) A. A tape records 1600 characters per inch and travels at 50 inches per second this yields a transfer rate of one character per every _____ micoseconds.

B. 80% of the memory refrences take 500 nanoseconds, 15% of the references take 200 microseconds, 4% take 1 millisecond and 1% take .025 seconds. The average access time is?

C. What % Utilization of the cpu is obtained if two process A { R∞, C 40, I 10, E } B { R∞, I 40, C 20, E } are both running (R, C, I, E like in the project)? _____

D. What % Utilization if just A is running? _____
Just B? _____

11. Page Replacement: (read whole problem before answering)

(15pt) A. There is a "best alogrithm" called

B. But it impossible to use because...

C. However there is a good approximation called

D. But it isn't used either much because

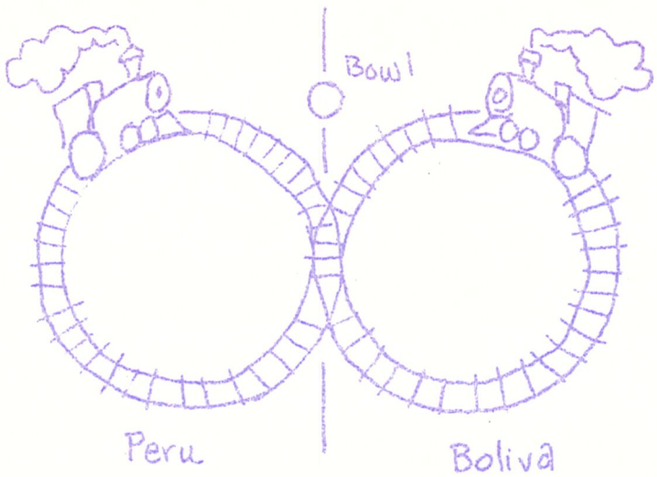
E. The algorithm in C can be approximated by NRU (not recently used) Describe how this could be used like the "dirty bit"

12. General;

(10pt) A. What is the primary goal of a operating system for a user's view?

B. List (4) four properties, goals or responsibilities of an operating system implied by A.

13. High in the Andes Mountains, there are two circular railroad lines. As show in the diagram, one line is in Peru,



the other in Boliva. They share a section of track, where the lines cross a mountain pass that lies on the international border. Unfortunately, the Peruvian and Bolivian trains occasionally collide when simultaneously entering the critical section of track (the mountain pass). The trouble is, alas, that the drivers of the two trains are BLIND and DEAF, so they can neither see nor hear each other.

The two drivers agree on the following method of preventing collisions. They set up a large bowl at the entrance to the pass. Before entering the pass, a driver must stop his train, walk over to the bowl, and reach into it tosee if it contains a pebble. If the bowl is empty, the driver finds a pebble and drops it into the bowl, indicating that his train is entering the pass; once his train has cleared the pass, he must walk back to the bowl and remove his pebble, indicating that the pass is no longer being used. Finally he walks back to the train and continues down the line. If a driver arriving at the pass finds a pebble in the bowl, he leaves the pebble there; he repeatedly takes a siesta and re-checks the bowl until he finds it empty. Then he drops a pebble in the bowl and drives his train into the pass.

(MORE →)

A. Explain how a subversive train schedule made up by
(4pt) the Bolivian ~~driver~~ officials could block the ~~Bolivi~~ Peruvian train forever.

B. Explain why this unlimited blocking never occurred.
(4pt)

C. Explain why the two trains crashed one day.
(4pt)

Following the crash they change the use of the bowl. The Bolivian driver must wait at the entry until the bowl was empty, drive through the pass and walk back to put a ~~sto~~ pebble in the bowl. The Peruvian driver must wait at the entry until the bowl contains a pebble drive through the pass and walk back to remove the pebble. Prior to this arrangement, the Peruvian train ran twice a day and the Bolivian train ran once a day.

D. Explain why the Peruvians were unhappy with the new
(4pt) arrangement.

E. Using two bowls, devise an arrangement that avoids
(8pt) crashes and the problem in D.

CP 4611 Midterm 12 march 86 by _____

each problem's value is listed to the left of the problem

1. Scheduling. For each algorithm complete the Gantt chart and the table below. (quantum = 6)

(20)

JOB	ARRIVE TIME	SERVICE TIME	PRIORITY
A	0	12	2
B	1	20	3
C	5	4	2
D	8	15	5
E	10	9	4

FCFS

SJN

RR

Pre emptive Priority

0 15 30 45 60

	FCFS		SJN		RR		Preemptive Priority	
JOB	WAIT TIME	RESPONSE TIME	WAIT TIME	RESPONSE TIME	WAIT TIME	RESPONSE TIME	WAIT TIME	RESPONSE TIME
A								
B								
C								
D								
E								
AVERAGE								

2. A disk which rotates at 3600 rpm has 30 sectors per track and each sector contains 512 bytes.

(9)

A. Average latency time is

B. Transfer time (for 1 sector)

C. Thus while transferring data, a character comes every ____ μsec.

3. page replacement algorithms: The top row of each table below is the same page reference string. Show the contents of memory after each reference. If two or more frames are available victims ALWAYS chose the lowest numbered frame. Initially no pages are in memory.

(12)

FIFO

FRAME NUMBER	0	9	1	9	8	2	9	7	0	6	3	9	8	6	5	7	3	5	9
0																			
1																			
2																			
3																			

total number of page faults _____

LRU

FRAME NUMBER	0	9	1	9	8	2	9	7	0	6	3	9	8	6	5	7	3	5	9
0																			
1																			
2																			
3																			

total number of page faults _____

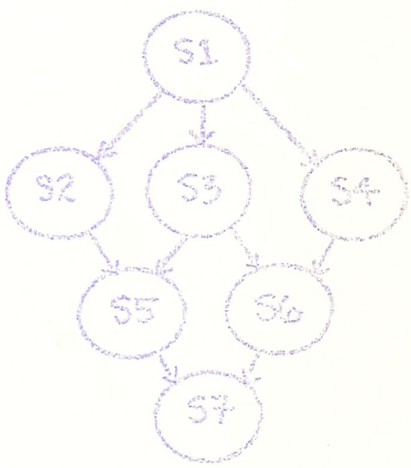
optimal

FRAME NUMBER	0	9	1	9	8	2	9	7	0	6	3	9	8	6	5	7	3	5	9
0																			
1																			
2																			
3																			

total number of page faults _____

4. Use semaphores and the cobegin/coend statement to "express" the precedence graph to the right. Be sure to show the initial values of all semaphores

(10)



5. Banker's Algorithm

	Allocation	Max	Avail
A	(0 0 0 0)	(1 2 5 9)	(0 1 1 2)
B	(0 3 3 2)	(1 4 4 4)	
C	(2 0 0 1)	(2 0 1 2)	
D	(0 0 2 2)	(1 2 3 3)	

A. For the "snapshot" to the right. Show the system is in a safe state by giving a sequence of "completion" and show the contents of avail after each completion. (10)

B. Process A requests (0,1,0,0) show that granting this request is unsafe.

C. Explain why after granting the request in part B the system isn't deadlocked.

6. More on Paging

A Define "Working Set", explain how it is computed and its relevance to paging

B. Typical program behavior. List three features of typical programs that work to the advantage of paging. (12)

C. There are two major "costs" to paging, list them

(12) B. Dirty Bit

C. Stale Time

D. Relocatable

8. Producer/Several Consumers: Buffer: Array[0..99] of things initially empty

The producer produces "things" and stores it into the buffer(array).

(15) each of the consumers "eat" things from the buffer. Using semaphores write "pseudo-code" code for both the producer & the consumers.

Machine interface. Project Part 3.

Project up and running (by hook or by crook)

major subprojects
1. event manager or interupt manager
2. boot loader and intialization
3. modifications to psource
4. integration (always major)

code directory
memory
msource - six new functions
memh - list of external functions
memd - "memdu" team2 still with errors

queue
qsource, qh, qd } unchanged

process
psource → Project-part-2
phroch - in plib
phrocd → project-part-2

hardware
hsource - hard7v, top, middle, bottom
hardh - on SCRI::
hardd - void.

event
esource - there but with stubbs
einclde - exists but in no lib

boot - philosopher's test case. (updated)

subproject descriptions

2. boot loader: Takes the quasi assembly code in the file boot and loads it into memory starting at location zero
2. initialization: Includes the above and all file action. (Must be in the main program esource.)
3. process modifications: there is a clock now so the "timing part" of the pcb can be filled in. Also a context switcher. Changes to receive (and request?) see doreceive in "bottom". Addition of num of processes ~~for~~ existing not counting null & a call to panic when it drops to zero.
1. interrupts:
   a. timeslice timer ~ 50 - 100 cpuclocks
   b. clock ticks ~ every 20-25 cpuclocks
   c. rupt file (debug calls)
   d. input file (break points)

   priority highest d lowest a
4. odds & ends: finalization, dodebug, error catching

library responsibilities

The good doctor will control resource with the exception of middle - varma
The teams 0 & 2 will jointly control psource until such time that the code stablizes
The teams 0 & 2 will individually control their own copy of esource.

Transport Layer
- between session entities
- optimizes underlying resources
- Class of service
- flow control
- multiplexing / splitting
- TW Simultaneous
- segmentation & blocking

Session Layer
- manages the dialog

Presentation Layer
- data transformation / formatting
- Virtual Terminals Protocols
- File Transfer Protocols

Application Layer
- system management
- application management
- user processes

---

a. what does partner look like presentation
b. Who is partner : Session
c. Where is partner : Transport
d. Along what route do we get there : network
e. each step : Link
f. use medium : physical.

Network Reference Model

Physical Layer

"transparent transmission of bit streams across the physical interconnection

full / half duplex
bit serial or n-bit parallel
pt to pt or multipoint ← identity
same order as given from data link

Data Link Layer

shield high levels from the characteristics of the physical medium

error detection / correction
but independent of data being transmitted

does not provide for segmenting or blocking

connects two network-entities in adj systems

data unit called "a frame"
frame delimiting

same order of frames

flow control — hey stop for awhile I'm overloaded

Network Layer

transparent transfer of data given by transport layer
network to network "end to end" (pt to pt)
virtual connection routing & relaying
no same order Packet level

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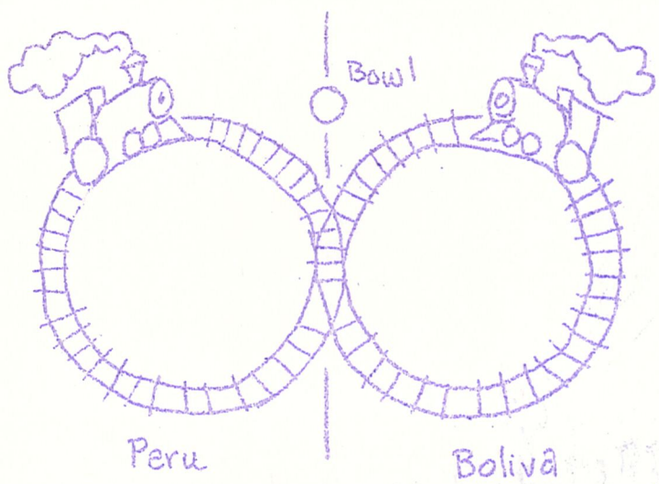

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