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) (blocked → 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
(12pt) an alternative.

A. Give three (3) advantages to FIFO:

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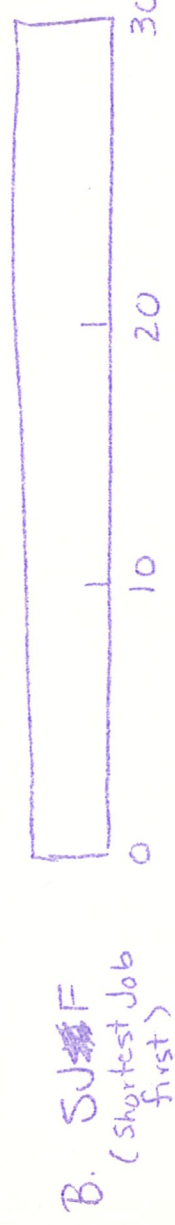1. Job scheduling:

2. Disk Scheduling:

3. Page replacement:

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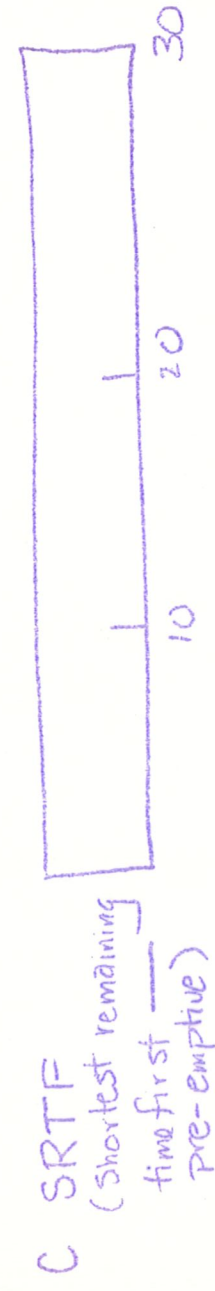scheduling algorithms and compute
the average wait time

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

A. FIFO

0	10	20	30

aver wait _____

B. SJ#F
(Shortest Job
first)

0	10	20	30

aver wait _____

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

	10	20	30

aver wait _____

5. Put T (true) or F (false) in the squares depending
(20pt) 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

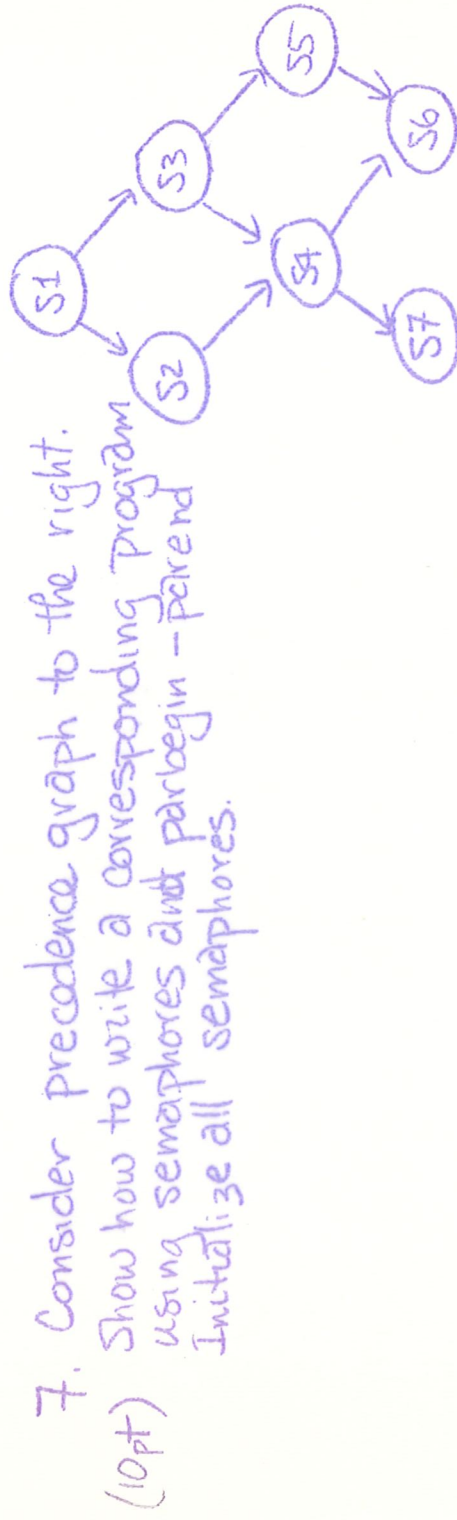I. Is used in CPM

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. Consider precedence graph to the right.
(10pt) 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. A Complete the resource allocation
(16pt) graph from the info to right.

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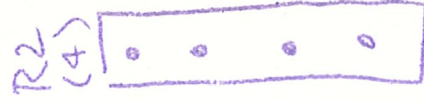sequences which processes
can be completed.

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?

	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

R2 (4)

R1 (3)

P1   P2   P3

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10. Arithmetic

(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 _____ microseconds.

B. 80% of the memory references 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 $\begin{cases} R \approx \\ C 40 \\ I 10 \\ E \end{cases}$ B $\begin{cases} R \approx \\ I 40 \\ C 20 \\ E \end{cases}$ are both running (R, C, I, E like in the project)? _____

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

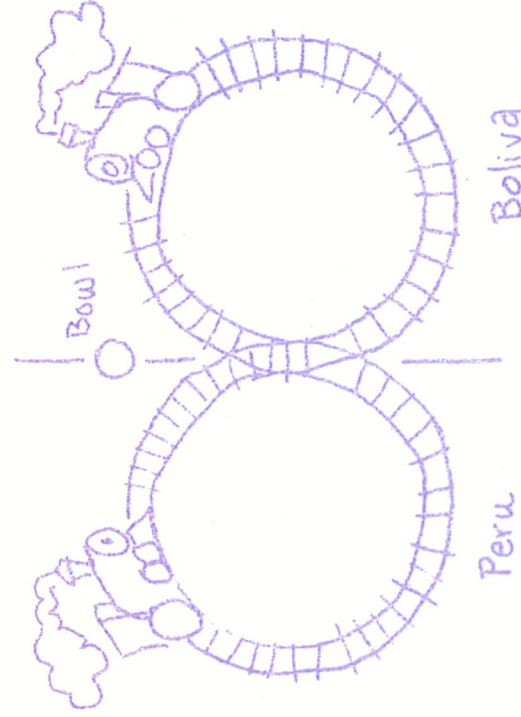11. Page Replacement: (read whole problem before answering)
(15pt) A. There is a "best algorithm" called

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 of an operating system implied by A.

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

Bowl

Peru   Boliva

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 to see 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 →)

13 (con't)

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

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