EASTERN UNIVERSITY, SRILANKA

SECOND EXAMINATION IN SCIENCE - 2004/2005

SECOND SEMESTER (Oct./Nov.,2006)

CS202 – Operating System

(Repeat)

Answer all questions **Time: 2Hours**

Q1.

i. Provide definitions for the following terms:
   a. Program
   b. process
   c. process state

ii. What are the advantages of multiprogramming systems over non-multiprogramming systems?

iii. What is PCB (Process Control Block)? Why is it used for?

iv. Can a process make a transition from the Ready state to the Blocked state? Why or why not?

v. What are race conditions? How can they be prevented?

vi. Describe the operations P(s) and V(s) on a semaphore s.
   a. What does P do?
   b. What does V do?
   c. What is special about the way P and V are performed that enable them to solve the "race conditions" problem?

Q2.

i. Define/Describe the following terms:
   a. Context switch
   b. Scheduler

ii. Discuss/explain the following scheduling methodologies:
   - First Come First Serve (FCFS)
   - Non preemptive Shortest Job First(SJN)
   - Round Robin(RR)

iii. Explain the difference between preemptive and non preemptive scheduling.

iv. Suppose the following jobs are to be executed in a uniprocessor system

Job Number	*Arrival Time*	*Service Time*
1	0	4
2	1	8
3	3	2
4	10	6
5	12	5

Ignore process switching overhead. For each of the following scheduling methods determine the turnaround time for each process, and the average turnaround for all jobs.

i. FCFS
ii. SJN
iii. RR, quantum = 3

Q3.

i. Describe the necessary conditions under which a deadlock can occur in an operating system.

ii. What condition for deadlock does the following solution attack?

"If a process must wait for a needed resource, it drops all of its previously held resources and tries to acquire all resources again."

iii. Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Show that the system is deadlock free.

iv. Explain the Banker's algorithm of deadlock avoidance.

v. Suppose a system has four processes P0, P1, P2 and P3 and five types of resources R0, R1, R2, R3 and R4 that can be allocated to these processes. The current allocation and maximum needs are as follows:

Allocated:

Process	R0	R1	R2	R3	R4
P0	1	0	2	1	1
P1	2	0	1	1	0
P2	1	1	0	1	0
P3	1	1	1	1	0

Maximum:

Process	R0	R1	R2	R3	R4
P0	1	1	2	1	3
P1	2	2	2	1	0
P2	2	1	3	1	0
P3	1	1	2	2	1

Available resources are:

R0	R1	R2	R3	R4
0	0	X	1	2

Find out the smallest value of X for which this is a safe state.

Q4.

i. Define or explain each of the following:

- Paging
- virtual memory
- Page Frame

ii. Explain, compare, and contrast the advantages and disadvantages of the following resource allocation policies:

a. First-fit

b. Best-fit

iii. Discuss the differences between logical and physical addresses.

iv. Under what circumstances do page faults occur?

v. Given a system with 1024 pages, virtual memory size of 512KB, and physical memory of 64KB. A process running in an OS with paging has the following page table. All numbers are in decimal.

a.) What is the page size of the system?

b.) What is the highest frame number in the system?

c.) How many bits are there in the logical address?

d.) How many bits are there in the physical address?

e.) What is the exact physical address for virtual address 5100?

f.) What is the exact physical address for virtual address 2058?

g.) What is the exact virtual address for physical address 2700?

Page Table

Virtual Page #	Physical Page #
0	3
1	7
2	8
3	1
4	2
5	9
6	5
7	4
8	0
9	6

vi. Given a system with 3 memory frames and 10 virtual memory pages using LRU replacement strategy

(a) Show how the following page requests are placed in memory by the memory replacement technique. (I.S.=InitialState,T.L.=TimeLoaded)

(b)Find how many page fault(s) will occur?

LRU replacement strategy:

T.L.	I.S.	2	3	6	3	2	9	6	1	2	9
0	6										
1	8										
2	3										