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EASTERN UNIVERSITY, SRI LANKA  
SECOND EXAMINATION IN SCIENCE 2003/2004 (Repeat)  
FIRST SEMESTER (November/December, 2004)

CS 202 Operating Systems

Answer all questions

Time allowed: 2 Hours

Q1 Answer all parts

(a) What are the functions of an operating system?

What is resource preemption? Explain.

(b) Explain the concept of *batch processing*.

What is *Turn-around time* in a Batch System? Explain

(c) What is *Multiprogramming* and what are the architectural requirements of such a system?

Q2 Answer all parts

(a) State clearly what race condition is, and give an example of it. Explain clearly how race condition would be avoided.

(b) Five batch jobs A through E, arrive at a computer center almost at the same time. Their estimated running times are 15, 11, 9, 12, and 14 minutes. Their (externally determined) priorities are 5, 7, 4, 3 and 6, respectively, with 7 being the highest priority. For each of the following scheduling algorithms, determine the mean process turnaround time. Ignore process-switching overhead.

(i) Round robin.

(ii) Priority scheduling.

(iii) First-come, first served (run in order 15, 11, 9, 12, 14).

(iv) Shortest job first.

For (i), assume that the system is multiprogrammed, and that each job gets its fair share of the CPU (the time quantum 2 minutes). For (ii) to (iv) assume that only one job runs at a time, until it finishes. All jobs are completely CPU bound.

**Q3 Answer all parts**

- (a) Briefly describe the **Paging** approach to memory management with reference to how the **virtual address 10001010** would be translated to a real memory address (NB: The part of the above address in **bold** indicates the page number and the other part indicates the displacement).
- (b) Describe the demand paging system and describe a procedure for handling **page fault**.
- (c) Describe the following page replacement algorithms:
  - i. FIFO
  - ii. LRU

Given that main memory is composed of four frames and that a program has been divided into eight pages (numbered 0 through 7).

How many page faults will occur using LRU with a request list of 0, 1, 7, 2, 3, 2, 7, 1, 0, 3 if the four page frames are initially empty.

**Q4**

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

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

A system has four processes P0, P1, P2, and P3 and five allocatable resources R0, R1, R2, R3, and R4. The current allocation and maximum needs are as follows:

	<i>Allocated</i>					<i>Maximum</i>				
	R0	R1	R2	R3	R4	R0	R1	R2	R3	R4
P0	1	0	2	1	1	1	1	2	1	3
P1	2	0	1	1	0	2	2	2	1	0
P2	1	1	0	1	0	2	1	3	1	0
P3	1	1	1	1	0	1	1	2	2	1

*Available*

R0	R1	R2	R3	R4
0	0	X	1	4

What is the smallest value of X for which this is a safe state?