EASTERN UNIVERSITY, SRI LANKA

SECOND EXAMINATION IN SCIENCE - 2003/2004 (Proper & Repeat)

SECOND SEMESTER (June -July 2005)

CS202 Operating System

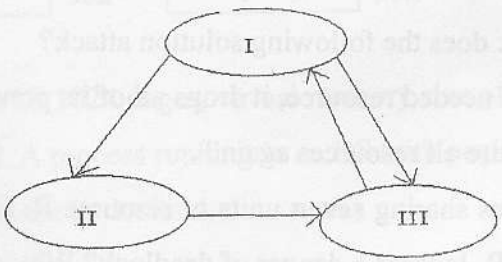
Answer all questions **Time Allowed: 2 Hours**

Q1

i. Distinguish between a program and a process.

ii. List the various states that a process can take during its lifetime, from the time the process is created to its eventual departure from the system.

iii. Given the following state transition diagram for processes, what are the correct labels for I, II, and III?



iv. Describe the following terms related to inter process communication:

a. race condition

b. mutual exclusion

v. Which of the following actions may result in a process becoming blocked?

a. A process executes a P (wait) operation on a semaphore.
b. A process executes a V (signal) operation on a semaphore.
c. A process exits from a critical section.
d. A process within a critical section changes the value of a shared variable.

Q2.

i. List the objectives of a good process scheduling policy.

ii. Draw the execution pattern (use X) for the following process scheduling techniques using the data below;

Process:	P1	P2	P3	P4	P5
Arrival Time:	2	3	0	5	1
Service Time:	1	1	5	3	3

First Come First Serve:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
P1														
P2														
P3														
P4														
P5														

Shortest Job First:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
P1														
P2														
P3														
P4														
P5														

Round Robin (time slice = 1, Preemptive):

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
P1														
P2														
P3														
P4														
P5														

iii. Compute average turn around time for each of the above algorithms.

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. A system has **three** processes sharing **seven** units of resource R. Each process may request up to **three** units of R. Is there a danger of deadlock? Why or why not?

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	1

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

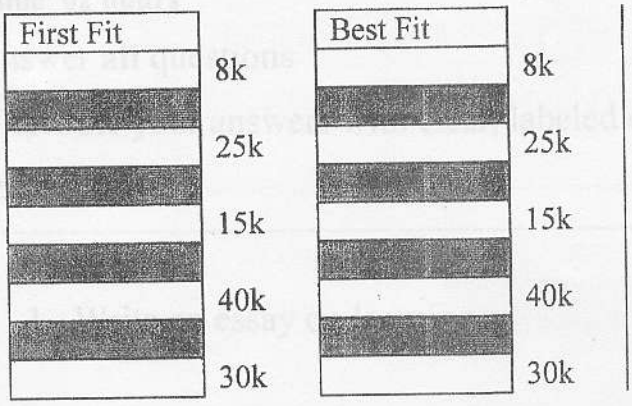
Q4.

i Describe the following memory allocation algorithms:

a. First – Fit

b. Best – fit

ii Using the memory partitions below, indicate how an operating system using First-fit or Best-fit placement algorithms will place the following memory requests; 15k, 25k, 30k, 5k, 10k.



iii 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

iv. 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										