



EAST WEST UNIVERSITY BANGLADESH
Department of Computer Science & Engineering

CSE325: Operating System (3)

Final Exam

Fall 2016

Total Marks: 30

Instructor: Dr. Md. Shamim Akhter

Time: 90 minutes

1. Consider a system with four (4) processes (P1 through P4) and following four (4) type resources: 5 tape drives (TD), 2 graphic displays (GD), 4 printers (P), 3 disks (D). The current resource allocation, need matrix and available vector are given below:

| Process ID | Allocated | | | | Need | | | |
|------------|-----------|----|---|---|------|----|---|---|
| | TD | GD | P | D | TD | GD | P | D |
| P1 | 2 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| P2 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 2 |
| P3 | 1 | 0 | 1 | 1 | 3 | 1 | 0 | 0 |
| P4 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |

| Available | | | |
|-----------|----|---|---|
| TD | GD | P | D |
| 1 | 0 | 2 | 0 |

- a) Evaluate the process sequence that will prove that this system is in a safe state or identify that it is not in a safe state. (4)
- b) Prove that the safety algorithm requires the order of $m \times n^2$ operations. (2)
- c) Process1 has two sequential modules a1 and a2 and Process2 has two sequential modules b1 and b2.
 We want to guarantee that a1 happens before b2 and b1 happens before a2.
 Two semaphores sem1 and sem2 are initialized to zero (0).

init(&sem1, 0);

init(&sem2, 0);

| Process 1 | Process 2 |
|--|--|
| a1; wait(&sem2); signal(&sem1); a2; | b1; wait(&sem1); signal(&sem2); b2; |

While working on the problem, you may have the above situation.

- i. What is the problem in the above solution? (1)
 - ii. Write the proper solution of the problem? (3)
- 2.
- a) What is process relocation? How does the OS maintain process relocation? (2)
 - b) Suppose the page table for the process currently executing on the processor looks like the

following. The **page size is 1,024 bytes**. Write the name of the problem that is occurred by addressing the **logical address 2500**? Describe (with figure) the actions taken by the operating system when the above problem occurs. (3+1)

| Page # | Frame# |
|--------|--------|
| 0 | 1 |
| 1 | 2 |
| 2 | - |
| 3 | - |

- c) Suppose that a newly-created process has **four (4) page frames** allocated to it, and then generates the page references as below:

A B C D A B E C A B C D A

How many page faults would occur with the following page replacement algorithms:

- i. **Clock.** (2)
- ii. **Optimal page replacement (OPT).** (2)

3.

- a) A disk request queue has requests for blocks on the following cylinders (ordered by time of arrival): **55, 58, 39, 18, 90, 160, 150, 38, 184**

The disk has **100 cylinders** numbered 0 through 99. The disk head is currently at cylinder 100 and is **moving towards the higher tracks**.

Calculate the total seek distance for each of the following algorithms:

C-LOOK and LOOK. (6)

- b) **Contiguous allocation** of files leads to fragmentation, because some space in the last block will be wasted in files whose length is not an integral number of blocks. Is this internal fragmentation or external fragmentation? Explain. (2)
- c) Given a block size of 512B and 4B pointer is required to point a block. How big can a file be if you have a single index block in an index file management scheme? (2)