

Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science & Technology

Uva Wellassa
University

1st Semester Examination March/April 2013

CST 322-2/IIT 413-2 Operating Systems Concepts and Design

Time Duration : Two Hours (02 hrs.)

Number of Questions : Five (05)

Answer Only Four Questions.

1.

- a. What are the principle events that cause process creation and process termination?
(4 mark)
- b. Processes use Mutual Exclusion to find some way to prohibit more than one process from reading and writing the shared data at the same time. State four techniques which are possible to use with Mutual Exclusion and explain only one technique by using one example.
(7 mark)
- c. Five batch jobs A through E, arrive at a computer center at almost the same time. They have estimated running times of 10, 6, 2, 4, and 8 minutes. Their (externally determined original order) priorities are 3, 5, 2, 1, and 4, respectively, with 5 being the highest priority.
For each of the following scheduling algorithms, determine the process turnaround time.
(14 mark)
 - i. Round Robin
 - ii. First-Come, First-Served

2.

- a. There are two ways to keep track of memory usage of a computer system. Briefly explain them.
(4 mark)
- b. If the physical memory of the computer is large enough to hold all the processes, no need to use any memory overloading schemes. But in practice, the total amount of RAM needed by all the processes is often much more than that can fit into the memory. State two general approaches which can be used to deal with memory overloading.
(2 mark)

c. Consider a single-level paging system with the following parameters:

- 2^{32} bytes of physical memory
- Page size of 2^{10} bytes
- 2^{16} pages of logical address space.

- i. How many bits are in a logical address?
- ii. How many bytes are in a frame?
- iii. How many bits in the physical address specify the frame?
- iv. How many entries are there in the page table?
- v. How many bits are there in each page table entry? Assume each page table entry contains one valid/invalid bit.
- vi. What is the structure of a page table entry? (7 mark)

d. Suppose that pages in a virtual address space are referenced in the following order:

1 2 1 3 2 1 4 3 1 1 2 4 1 5 6 2 1

There are three empty frames available. Assume that paging decisions are made on demand, i.e., when page faults occur.

Show the contents of the frames after each memory reference assuming,

- i. LRU replacement policy is used.
- ii. First-in First-out replacement policy is used.

How many page faults occur in each case?

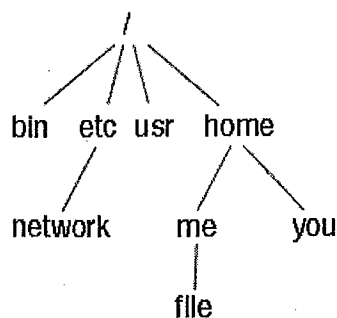
(12 mark)

3.

a. What are the file access methods used in operating system?

(2 mark)

b. Consider the following file system:



Specify the absolute path name to the file "file" and the relative path name from the directory "network". (4 mark)



- c. A file allocation table (FAT) is a table that an operating system maintains on a hard disk that provides a map of the clusters (the basic units of logical storage on a hard disk) that a file has been stored in.

File A uses disk blocks 4, 7, 2, 10, and 12. File B uses disk blocks 6, 3, 11, 14.

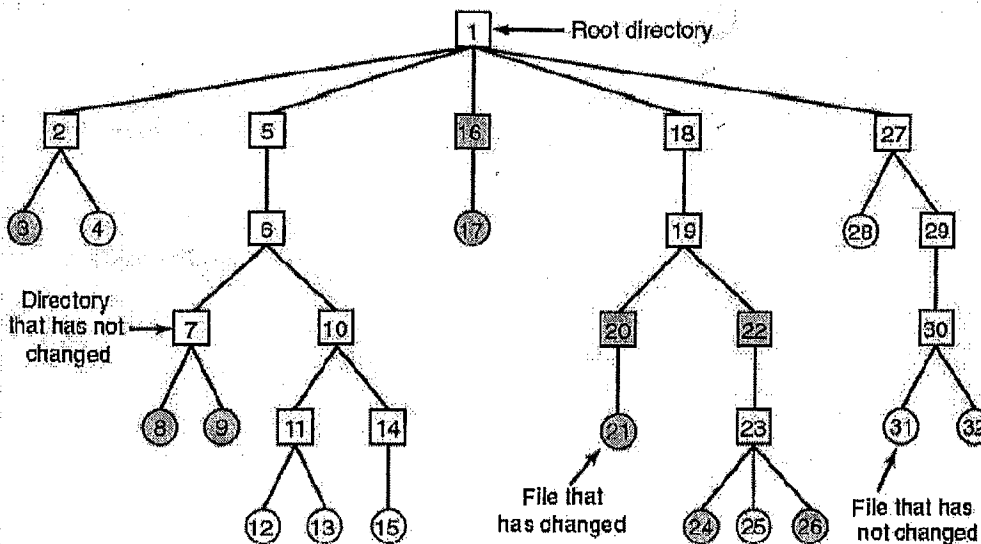
Assume that physical block addressing starting from 0 to n-1 where n is the number of physical addresses available in the system.

- i. Draw the FAT structure for file A and B.
- ii. What are the advantages of FAT?
- iii. What are the disadvantages of FAT?

(7 mark)

- d. Two strategies can be used for dumping a disk to a tape: A physical dump and a logical dump. A logical dump starts at one or more specified directories and recursively dumps all files and directories found there, that have changed since some given base date. Most UNIX systems use logical dumping because the dump tape gets a series of carefully identified directories and files.

Following figure shows a file tree with directories (squares) and files (circles). The shaded items have been modified since the base date and thus need to be dumped according to the logical dumping.



Assume that each directory and file is labeled by its I-node number and logical dumping algorithm maintains a bitmap indexed by i-node number with several bits per I-node. Show all the phases of the operation of this algorithm by using the Bitmaps used by logical dumping algorithm.

(12 mark)

4.

- a. Differentiate device driver and device controller. (4 mark)
- b. Briefly explain Direct Memory Access (DMA) by using suitable diagrams. (6 mark)
- c. What are the reasons to use RAID levels in a Disk? What are the differences on RAID level 4 over RAID level 5? (3 mark)
- d. Disk arm movement is very expensive operation. Therefore operating systems use disk scheduling algorithms to reduce seek time. Thus disk scheduling algorithms have been implemented and these algorithms receive a queue of request positions (arm motions) and the current head position.

Following shows the current details of the Disk.

Queue: 100, 175, 51, 133, 8, 140, 73, 77

Head: 63

Find the seek order and seek distance by considering the following algorithms.

- i. First-Come, First-Served (FCFS)
- ii. Shortest Seek First (SSF) (12 mark)

5.

You can consider Linux, Windows Vista or Symbian operating system and briefly explain the following topics related to that.

- a. Processes management (8 mark)
- b. Memory management (9 mark)
- c. File system management (8 mark)