

KENYA METHODIST UNIVERSITY

FIRST TRIMESTER EXAMINATIONS, APRIL 2009

FACULTY : ARTS AND SCIENCES
DEPARTMENT : COMPUTER INFORMATION SYSTEMS
COURSE CODE : CISY 201
COURSE TITLE : OPERATING SYSTEMS CONCEPTS
TIME : 2 HOURS

Instructions:

Answer ALL questions in Section A and any other TWO questions in Section B.

Section A (30 Marks)

- i. What are the three main objectives of an operating system? (3 Marks)
- ii. Give two reasons why caches are useful. What problems do they solve? What problems do they cause? If a cache can be made as large as the device for which it is caching (for instance, a cache as large as a disk), why not make it that large and eliminate the device? (3 Marks)
- iii. Explain the difference between internal fragmentation and external fragmentation. (4 Marks)
- iv. What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other? (4 Marks)
- v. Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs. (4 Marks)
- vi. Consider a system that supports the strategies of contiguous, linked, and indexed allocation. What criteria should be used in deciding which strategy is best utilized for a particular file? (3 Marks)

- vii. What are the main differences between capability lists and access lists?
(4 Marks)
- viii. What is an MMU? What role does it play in OS memory management?
(3 Marks)
- ix. Explain the purpose of the open and close operations. (2 Marks)

Section B (40 Marks)

Question Two (20 Marks)

- i. A number of jobs enter a system with characteristics shown in the table.

Job	Entry Time	Burst Time
1	0	3
2	2	2
3	4	6
4	5	5
6	7	1

Determine the average turnaround (or completion) time for these jobs using each of these scheduling mechanisms:

- FCFS
- Shortest job first with preemption.
- Round robin with time quantum of 3 seconds (no preemption).

(6 Marks)

- ii. For each of the following pairs of terms, define each term, making sure to clarify the key difference(s) between the two terms.

- “virtual machine” and “physical machine”
- “virtual address” and “physical address”
- “binary semaphore” and “counting semaphore”
- “paging” and “segmentation”

(12

Marks)

- iii. Why are page sizes always powers of 2?

(2 Marks)

Question Three (20 Marks)

- i. Researchers have suggested that, instead of having an access list associated with each file (specifying which users can access the file, and how), we should have a user control list associated with each user (specifying which files a user can access, and how). Discuss the relative merits of these two schemes.

(6 Marks)

- ii. How does DMA increase system concurrency? How does it complicate hardware design?

(4 Marks)

- iii. A password may become known to other users in a variety of ways. Is there a simple method for detecting that such an event has occurred? Explain your answer. (2 Marks)
- iv. Make a list of at least four security concerns for a computer system for a bank. For each item on your list, state whether this concern relates to physical security, human security, or operating system security. (8 Marks)

Question Four (20 Marks)

- i. Define the essential properties of (a) Batch, (b) Interactive, (c) Time sharing, and (d) Real time operating systems. (8 Marks)
- ii. Fragmentation on a storage device could be eliminated by recompactation of the information. Typical disk devices do not have relocation or base registers (such as are used when memory is to be compacted), so how can we relocate files? Give three reasons why recompacting and relocation of files often are avoided. (3 Marks)
- iii. State three advantages of placing functionality in a device controller, rather than in the kernel. State three disadvantages. (6 Marks)
- iv. Describe the best-fit algorithm for memory allocation, when using dynamic memory allocation with linked lists. (3 Marks)