

R 8206

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Fifth Semester

Computer Science and Engineering

CS 333 -- OPERATING SYSTEMS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the purpose of the command interpreter?
2. Why is the command interpreter usually separate from the kernel?
3. State why a swapping scheme is implemented in a medium term scheduler?
4. Explain why interrupts are not appropriate for implementing synchronization primitives in multiprocessor systems.
5. "A major problem with priority scheduling algorithms is starvation". Briefly discuss the solution suggested to solve this problem.
6. State if allocating dynamic memory is supported in contiguous memory allocation.
7. How does the system detect thrashing? Briefly state.
8. Consider a system where free space is kept in a list. Suppose that the pointer to the free-space list is lost. Can the system reconstruct the free-space list? Discuss.
9. State the major overhead associated with relocation of files on secondary storage.
10. Would one classify Linux threads as user-level threads or as kernel-level threads? Why?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Give two reasons why cache is 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? (8)

- (ii) What are the advantages and disadvantages of using the system call interface for manipulating both files and devices?
- (iii) In what ways is the modular kernel approach similar to the layered approach? In what ways does it differ from the layered approach?

Or

(b) Define the essential properties of the following types of operating systems :

- (i) Batch
- (ii) Time sharing
- (iii) Real time
- (iv) Distributed.

12. (a) (i) Describe the actions taken by a kernel to context-switch between processes.
- (ii) Considering both the systems and the programmers' levels discuss what are the benefits and determinants of symmetric and asymmetric communication.
- (iii) What is a Process Control Block? Describe the structure.

Or

- (b) (i) Define the critical section problem and discuss the three requirements that a solution to the critical section problem must satisfy.
- (ii) What is the optimistic assumption made in the deadlock-detection algorithm? How could this assumption be violated?
- (iii) Consider the dining-philosophers problem where the chopsticks are placed at the center of the table and any two of them could be used by a philosopher. Assume that requests for chopsticks are made one at a time. Describe a simple rule for determining whether a particular request could be satisfied without causing deadlock given the current allocation of chopsticks to philosophers.

13. (a) Consider the following five processes, with the length of the CPU burst time given in milliseconds.

PROCESS BURST TIME

P ₁	10
P ₂	29
P ₃	3
P ₄	7
P ₅	12

Consider the First Come First Serve (FCFS), Non Preemptive Shortest Job First (SJF), Round Robin (RR) (quantum = 10 milliseconds) scheduling algorithms. Illustrate the scheduling using Gantt Chart. Which algorithm will give the minimum average waiting time? Discuss. (16)

Or

- (b) (i) Compare the main memory organization schemes of contiguous-memory allocation, pure segmentation, and pure paging with respect to external fragmentation, internal fragmentation and the ability to share code across processes. (12)
- (ii) Compare paging with segmentation with respect to the amount of memory required by the address translation structures in order to convert virtual addresses to physical addresses. (4)

14. (a) (i) Discuss First Fit, Best Fit and Worst Fit strategies for memory allocation with a suitable example. (8)
- (ii) Diagrammatically illustrate and explain Internal and External Fragmentation. (8)

Or

- (b) Consider a file system that uses a modified contiguous-allocation scheme with support for extents. A file is a collection of extents, with each extent corresponding to a contiguous set of blocks. A key issue in such systems is the degree of variability in the size of the extents. What are the advantages and disadvantages of the following schemes?

- (i) All extents are of the same size, and the size is predetermined.
- (ii) Extents can be of any size and are allocated dynamically.
- (iii) Extents can be of a few fixed sizes, and these sizes are predetermined.

Discuss in detail. (16)

15. (a) (i) In the context of Linux operating system, discuss under what circumstances is the system-call sequence fork (), exec () most appropriate? When is vfork () preferable? (8)
- (ii) Discuss how the clone () operation supported by Linux is used to support both processes and threads. (8)

Or

- (b) (i) List and discuss the objectives of a file management system.
- (ii) What are the two distinct parts, a file system consists of?
- (iii) Consider the following augmentation of a remote-file-access protocol. Each client maintains a name cache that cache translations from file names to corresponding file handles. What issues should we take into account in implementing the name cache?
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