



# KINGS



COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**QUESTION BANK**

SUBJECT CODE: CS1253

YEAR: II

SUBJECT NAME: OPERATING SYSTEM

SEM : IV

**UNIT I FUNDAMENTALS**

1. What is an Operating system?
2. Why is the Operating System viewed as a resource allocator & control program?
3. What is the Kernel?
4. What are Batch systems?
5. What is the advantage of Multiprogramming?
6. What is an Interactive computer system?
7. What do you mean by Time-sharing systems?
8. What are multiprocessor systems & give their advantages?
9. What are the different types of multiprocessing?
10. What is graceful degradation?
11. What is Dual-Mode Operation?
12. What are privileged instructions?
13. How can a user program disrupt the normal operations of a system?
14. How is the protection for memory provided?
15. What are the various OS components?
16. What is a process?
17. What is a process state and mention the various states of a process?
18. What is process control block?
19. What are the use of job queues, ready queues & device queues?
20. What is meant by context switch?

21. What is co-operating process?
22. State any two distinguishing features of UNIX and Windows.
23. What is spooling?
24. Classify Real time systems.
25. Mention the features of real time systems
26. Define a thread. State the major advantages of threads.
27. State the assumption behind the bounded buffer producer consumer problem.
28. What is context witching?
29. Under what circumstances would a user be better off using a timesharing system rather than a PC or single-user workstation?
30. Discuss the differences between symmetric and asymmetric multiprocessing.
31. Can a multithreaded solution using multiple user-level threads achieve better performance on a multiprocessor system than on a single processor system? Justify?
32. Define RTOS
33. Define System calls

### **PART- B**

1. Explain the various types of computer systems. (16)
2. Explain how protection is provided for the hardware resources by the operating system. (16)
3. What are the system components of an operating system & explain them? (16)
4. Write about the various system calls. (16)
5. What are the various process scheduling concepts? (16)
6. Explain about interprocess communication. (16)
7. Give an overview about threads. (16)
8. Explain in detail about the threading issues. (16)
9. (i) Explain the facilities provided by the following operating system (10)  
(ii) List out the services provided by operating systems to programs and to the users of program. (6)

10. (i) Explain the process creation and termination process on process. (8)  
 (ii) Write short notes on co-operating process and schedulers. (8)
11. (i) List and discuss the various services provided by the operating system. (8)  
 (ii) List and discuss the important modules of an operating system (8)
- 13 (i) Define the essential properties of Real time operating Systems (6)  
 (ii) Discuss briefly the various issues involved in implementing Inter process communication (IPC) in message passing system. (10)
- 14 (i) Explain the different operations of processes. (6)  
 (ii) Differentiate symmetric and asymmetric multiprocessing system. (6)  
 (iii) In what ways is the modular kernel approach similar to the layered approach?  
 In what ways does it differ from the layered approach? (4)
15. (i) Discuss the critical section problem. State the basic requirements of critical section problem solution. (6)  
 (ii) Explain implementation of producers/Consumers problem using monitor. (10)

## **UNIT II PROCESS MANAGEMENT**

1. What is the purpose of system programs?
2. What is a thread?
3. What are the benefits of multithreaded programming?
4. Compare user threads and kernel threads.
5. What is the use of fork and exec system calls?
6. Define thread cancellation & target thread.
7. What are the different ways in which a thread can be cancelled?
8. Define CPU scheduling.
9. What is preemptive and nonpreemptive scheduling?
10. What is a Dispatcher?
11. What is dispatch latency?
12. What are the various scheduling criteria for CPU scheduling?
13. Define throughput?
14. What is turnaround time?
15. Define race condition.

16. What is critical section problem?
17. What are the requirements that a solution to the critical section problem must satisfy?
18. Define entry section and exit section.
19. Give two hardware instructions and their definitions which can be used for implementing mutual exclusion.
20. What is semaphores?
21. Define busy waiting and spinlock.
22. What is bounded waiting in critical region?
23. What are the four necessary conditions a system should possess in order to be termed as deadlock?
24. Explain associative mapping.
25. Why implementing synchronization primitives by disabling interrupts is not appropriate in a single processor system if the synchronization primitives are to be used in user level programs
26. State the assumption behind the bounded buffer producer consumer problem
27. What do you mean by a critical section problem
28. Define the use of Monitor

### **PART -B**

1. Write about the various CPU scheduling algorithms. (16)
2. Write notes about multiple-processor scheduling and real-time scheduling. (16)
3. What is critical section problem and explain two process solutions and multiple process solutions? (16)
4. Explain what semaphores are, their usage, implementation given to avoid busy waiting and binary semaphores. (16)
5. Explain the classic problems of synchronization. (16)
6. Write about critical regions and monitors. (16)
7. Give a detailed description about deadlocks and its characterization. (16)
8. Write in detail about deadlock avoidance. (16)
9. Explain the Banker's algorithm for deadlock avoidance. (16)

10. Give an account about deadlock detection. (16)
11. What are the methods involved in recovery from deadlocks? (16)
12. Describe the following scheduling algorithms. (16)
13. What is the important feature of critical section? State the dining philosophers problem and show how to allocate the several resources among several processes in a deadlock and starvation free manner. (16)
14. Consider the following five processes, with the length of the CPU burst time given in milliseconds.

Process	Burst time
P1	10
P2	29
P3	3
P4	7
P5	12

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

- 15.(a) (i) Show how to implement the wait() and signal() semaphore operations in multiprocessor environments using the TestandSet() instruction. The solution should exhibit minimal busy waiting. Develop pseudo code for implementing the operations. (8)

ii) Demonstrate that monitors and semaphores are equivalent in so far as they can be used to implement the same types of synchronization problems. (8)

17. Consider the following page reference string

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

How many page faults would occur for the following replacement algorithms, assuming three frames that all frames are initially empty? (16)

19. a) i) Construct a Resource Allocation Graph for the following scenario. At time 't' Process P1 request for a resource X, process P2 requests for a resource Y. Both the resources are available and they are allocated to the requesting process. At

time  $t_1$  where  $t_1 > t_2$  both the processes are still holding the resources, however process P1 request for Y which is held by P2, process P2 request for X held by P1. Will there be a deadlock? If there is a deadlock discuss the four necessary conditions for deadlock, else justify there is no deadlock. (8)

ii) With relevant example show that the implementation of a semaphore with a waiting queue may result in deadlock, Readers-Writers problem Definition (8)

20.a) Assume the following processes arrive for execution at the time indicated and also mention with the length of the CPU-burst time given in milliseconds.

Job	Burst time(ms)	Priority	Arrival time(ms)
P1	6	2	0
P2	2	2	1
P3	3	4	1
P4	1	1	2
P5	2	3	2

i) Give a Gantt chart illustrating the execution of these processes using FCFS, Round Robin(quantum=1), and Priority(Preemptive and Non preemptive). (4)

ii) Calculate the average waiting time and average turn around time for each of the above scheduling algorithm. (12)

### UNIT III- DEADLOCKS

1. Define deadlock.
2. What is the sequence in which resources may be utilized?
3. What are conditions under which a deadlock situation may arise?
4. What is a resource-allocation graph?
5. Define request edge and assignment edge.
6. What are the methods for handling deadlocks?
7. Define deadlock prevention.
8. Define deadlock avoidance.
9. What are a safe state and an unsafe state?
10. What is banker's algorithm?

11. Define logical address and physical address.
12. What is logical address space and physical address space?
13. What is the main function of the memory-management unit?
14. Define dynamic loading.
15. Define dynamic linking.
16. What are overlays?
17. Define swapping.
18. What are the common strategies to select a free hole from a set of available holes?
19. What do you mean by best fit?
20. What do you mean by first fit?
21. What is segmentation?
22. Define virtual memory.
23. Why should we use virtual memory?
24. State what is required to support dynamic memory allocation in contiguous memory allocation?
25. What is Thrashing?
26. What is Pre-paging?
27. Distinguish logical and physical address space.
28. Define virtual memory.
29. What do you mean by maskable and non maskable interrupt?
30. Explain the advantages of inverted page tables.
31. What is a translation look aside buffer used for?
32. What is the purpose of paging the page tables?
33. Why should paging be used by OS?

### **PART -B**

1. Explain about contiguous memory allocation. (16)
2. Give the basic concepts about paging. (16)
3. Write about the techniques for structuring the page table. (16)
4. Explain the basic concepts of segmentation. (16)

5. What is demand paging and what is its use? (16)
6. Explain the various page replacement strategies. (16)
8. What is thrashing and explain the methods to avoid thrashing? (16)
9. a) i) How can deadlock be detected? Explain. (10)  
ii) Write short notes on swapping. (6)
10. Discuss the advantages of paging memory management and the conversion of logical address into physical address with necessary hardware (16)
11. a) i) Consider a paging system with the page table stored in memory. If a memory reference takes 200 nano seconds, how long does a paged memory reference take? If we add associative registers, and 75 percent of all page table references are found in the associative registers, what is the effective memory reference time? (Assume that finding a pager table entry in the associative registers takes zero time, if the entry is there? (4)
- ii) On a system with paging, a process cannot access memory that it does not own, why? How could the operating system allow access to other memory? Why should it or should it not? (6)
- iii) Compare the segmented paging scheme with the hashed page table scheme for handling large address spaces. Under what circumstances is one scheme preferable over the other? (6)
15. a) i) Discuss the hardware support required to support demand paging. (4)
- ii) Give relevant examples and discuss situations under which the least frequently used page replacement algorithm generates fewer page faults than the least recently used page replacement algorithm. Also give an example and discuss under what circumstances does the opposite hold. (6)
- iii) Give relevant examples and discuss situations under which the most frequently used page replacement algorithm generates fewer page faults than the least recently used page replacement algorithm. Also give an example and discuss under what circumstances does the opposite hold. (6)

16. Consider the following page reference string:

2, 3, 4, 2, 1, 5, 6, 4, 1, 2, 3, 7, 6, 3, 2, 1

Calculate the number of page faults would occur for the following page replacement algorithm with frame size of 4 and 5. (16)

17.(a) i) Explain the page fault handling routine with diagram. (6)

ii) Explain Contiguous and Non contiguous memory allocation with example.(10)

## **UNIT IV MEMORY AND FILE MANAGEMENT**

1. What is virtual memory?
2. What is Demand paging?
3. Define lazy swapper.
4. What is a pure demand paging?
5. Define effective access time.
6. Define secondary memory.
7. What is the basic approach of page replacement?
8. What are the various page replacement algorithms used for page replacement?
9. What are the major problems to implement demand paging?
10. What is a reference string?
11. What is a file?
12. List the various file attributes.
13. What are the various file operations?
14. What are the information associated with an open file?
15. What are the different accessing methods of a file?
16. What is Directory?
17. What are the operations that can be performed on a directory?
18. What is virtual memory?
19. What is Demand paging?
20. Define lazy swapper.
21. What is a pure demand paging?

22. Define effective access time.
23. Define secondary memory.
24. What is the basic approach of page replacement?
25. What are the various page replacement algorithms used for page replacement?
26. What is a reference string?
27. What is a file?
28. What are the various file operations?
29. What are the information associated with an open file?
30. What are the most common schemes for defining the logical structure of a directory?
31. What is a path name?
32. Briefly discuss the relative advantage and disadvantages of sector sparing and sector slipping.
33. Define UFD and MFD.
34. What is a path name?
35. What is meant by Thrashing?
36. Name the entries makes up a File Control Block (FCB).
37. What are the functions of file organization module in file system?
38. Give an example of an application that could benefit from OS support for random access to indexed files
39. What are the advantages of the variation of linked allocation that uses a FAT to chain together the blocks of a file?

## **PART -B**

1. What are files and explain the access methods for files? File definition (16)
2. Explain the schemes for defining the logical structure of a directory. (16)
3. Write notes about the protection strategies provided for files. (16)
4. Explain the allocation methods for disk space. (16)
5. What are the various methods for free space management? (16)

- 6 a) Discuss the following page replacement algorithms, giving a suitable page reference string
- i) LRU (5)
  - ii) FIFO (5)
  - iii) Optimal (6)
7. b) i) State the various attributes of file and their purpose. Discuss various file operations. (10)
- ii) Discuss about demand paging. (6)
8. a) i) Discuss the hardware support required to support demand paging. (4)
- ii) Give relevant examples and discuss situations under which the least frequently used page replacement algorithm generates fewer page faults than the least recently used page replacement algorithm. Also give an example and discuss under what circumstances does the opposite hold. (6)
- iii) Give relevant examples and discuss situations under which the most frequently used page replacement algorithm generates fewer page faults than the least recently used page replacement algorithm. Also give an example and discuss under what circumstances does the opposite hold. (6)
9. i) Give an example for an application that could benefit from operating system support for random access to indexed files. (4)
- ii) List and briefly discuss the most common schemes for defining the logical structure of a directory. (12)
10. With neat diagram explain the different allocation methods of disk space. (16)
11. a) i) List and discuss various methods for implementing a directory. Single-Level Directory (6)
- ii) Explain and compare different file access methods. (10)
12. a) i) Explain the indexed and linked file allocation methods. Discuss the advantages and disadvantages in those methods. (10)
- ii) How are the processes and threads executed in Linux? (6)

## UNIT V FILE AND I/O SYSTEMS

1. What are the various layers of a file system?
2. What are the structures used in file-system implementation?
3. What are the functions of virtual file system (VFS)?
4. Define seek time and latency time.
5. What are the allocation methods of a disk space?
6. What are the advantages of Contiguous allocation? The advantages are
7. What are the drawbacks of contiguous allocation of disk space?
8. What are the advantages of Linked allocation?
9. What are the disadvantages of linked allocation?.
10. What are the advantages of Indexed allocation?
11. How can the index blocks be implemented in the indexed allocation scheme?
12. Define rotational latency and disk bandwidth.
13. How free-space is managed using bit vector implementation?
14. Define buffering.
15. Define caching.
16. Define spooling.
17. What are the various disk-scheduling algorithms?
18. What is low-level formatting?
19. What is the use of boot block?
20. What is sector sparing?
21. Briefly discuss the relative advantage and disadvantages of sector sparing and sector slipping.
22. Under what circumstances would one use the deferred procedure calls facility in windows XP?
23. What is low level formatting or physical formatting?
24. Differentiate RAID level 0 and RAID level 1.
25. List the features of Linux system.
26. What are the primary goals of the conflict resolution mechanism used by the Linux kernel for loading kernel modules
27. What is the kernel of an OS

28. Mention the importance of swap-space management

### **PART -B**

1. Write about the kernel I/O subsystem. (16)
2. Explain the various disk scheduling techniques (16)
3. Write notes about disk management and swap-space management. (16)
4. Write short notes on:
  - (i) Disk structure (5)
  - (ii) Indexed allocation (5)
  - (iii) Shortest-seek-Time-First (SSTF) scheduling. (6)
5. a) i) List and discuss the various methods for implementing a directory. Single-Level Directory (8)  
 ii) Some file system allows disk storage to be allocated at different levels of granularity. For instance, a file system could allocate 4KB of disk space as a single 4KB block or as eight 512 byte blocks. How could we take advantage of the flexibility to improve performance? What modifications would have to be made to the free-space management scheme in order to support this feature? (8)
6. b) Suppose that a disk drive has 5000 cylinders numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending request in the FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk scheduling algorithms?
  - i. FCFS
  - ii. SSTF
  - iii. SCAN
  - iv. Look (16)