KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
NAMAKKAL- TRICHY MAIN ROAD, THOTTIAM,TRICHY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
24CS303- PRINCIPLES OF OPERATING SYSTEMS
QUESTION BANK
Year/ Semester/ Sec: II/III/ A
UNIT –I INTRODUCTION TO OPERATING SYSTEMS
PART A

1. List and briefly define the four main elements of a computer?
2. Define the two main categories of processor register?
3. In general terms, what are the four distinct actions that machine instruction can specify?
4. What is an Interrupt?
5. How are multiple interrupt dealt with?
6. What characteristics distinguish the various elements of a memory hierarchy?
7. What is Cache Memory?
8. List and briefly define 3 Techniques of I/O operation?
9. What is the distinction b/w spatial locality & temporal locality?
10. Define Locality of Reference
11. What is an operating system?
12. What are the 3 objective of an OS Design?
13. List the Services of operating system function.
14. Define Kernel
15. Define system call.
16. What is System Programs?
17. What is Boot strapping?
18. Difference b/w Monolithic &Microlithic.
19. What is Multiprogramming?
20. Define Real Time System
21. What does the CPU do when there are no user programs to run?
22. Describe the actions taken by a kernel to context-switch between processes.
23. What is multi-core processor?
24. What is memory stall?
25. What is Boot strapping?

PART – B

1. Explain Operating System Structure and components.
2. Discuss multiprocessor systems in detail.
3. Explain in detail the types of system calls provided by a typical operating system.
4. Explain the purpose of system calls and discuss the calls related to device management and communications in brief.
5. Explain the concepts of virtual machines, their implementation and benefits in details.
6. What is a virtual machine? List out the advantages of virtualization. Explain the creation of a Virtual machine with a architecture diagram
7. Write short notes on operating system services and components.
8. Write in detail about the real time system and multiprocessor system.
9. Write in detail about hardware protection.
10. Explain the various types of System calls with an example for each?
11. Discuss about the functionality of system boot with respect to operating system.
12. Discuss about the evolution of virtual machines. Also explain how virtualization could

be implemented in operating systems.

13. Sketch the structure of Direct Memory Access in detail.
14. (i) With neat sketch discuss computer system overview

(ii) Enumerate the different operating system structure and explain with neat Sketch.

15. (i) State the basic functions of OS and DMA.

(ii) Explain system calls, system programs and OS generation.

16. (i) Distinguish between the client-server and peer-to-peer models of distributed systems.

(ii) Describe three general methods for passing parameters to the operating system with example.

17. (i) How could a system be designed to allow a choice of operating systems from which to boot? What would the bootstrap program need to do?

(ii) Describe the differences between symmetric and asymmetric multiprocessing. What are three advantages and one disadvantage of multiprocessor systems?

UNIT II PROCESSES AND THREADS

PART – A

1. Define Process?
2. Draw & briefly explain the process states?
3. What is process control block? List out the data field associated with PCB.
4. What is meant by context switching?
5. Define co- operating process and independent process.
6. What are the benefits of multithreaded programming?
7. What is a thread?
8. Under What circumstances CPU scheduling decision takes place.
9. What are the various scheduling criteria for CPU scheduling?
10. Write down the definition of TestandSet() Instruction.
11. Define busy waiting and spinlock.
12. What is mean by monitors?
13. What is mean by monitors?
14. Differentiate a Thread form a Process.
15. What are the difference b/w user level threads and kernel level threads?
16. What is the use of fork and exec system calls?
17. Define thread cancellation & target thread.
18. What are the different ways in which a thread can be cancelled?
19. Define PThreads
20. What is critical section problem?
21. What are the requirements that a solution to the critical section problem must satisfy?
22. Define mutual exclusion. Define entry section and exit section.
23. Define entry section and exit section.
24. Give two hardware instructions and their definitions which can be used for implementing mutual exclusion.
25. What is semaphore? Mention its importance in operating system.

PART-B

1) Explain the FCFS, preemptive and non-preemptive versions of Shortest-Job First and Round Robin (time slice = 2) scheduling algorithms with Gantt charts for the four Processes given. Compare their average turnaround and waiting time.

Process	Arrival Time	Waiting Time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

2) Discuss how scheduling algorithms are selected for a system. What are the criteria considered? Explain the different evaluation Methods.

3) Write in detail about several CPU scheduling algorithms.

4) What is critical section? Specify the requirements for a solution to critical section problem.

5) How monitors help in process synchronization.

6) Write in detail about deadlock avoidance.

7) Write in detail about deadlock recovery.

8) Explain the Banker algorithm for deadlock avoidance in detail with an example.

9) Consider the following set of processes, with the length of the CPU – burst time given in Milliseconds:

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The processes are arrived in the order P1, P2, P3, P4, P5, all at time 0.

1. Draw 4 Gantt charts illustrating the execution of these processes using FCFS, SJF Priority and RR (Time Slice = 1) scheduling

2. What is the turnaround time of each process for each of the scheduling?

3. Calculate the waiting time for each of the process

10) Consider the following questions based on the banker's algorithm:

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

(1) Define safety algorithm.

(2) What is the content of the matrix Need?

(3) Is the system in a safe state?

(4) If a request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately?

11) (i) What is meant by critical section problem? Propose a solution based on bakery algorithm.

(ii) Consider the following snapshot of a system:P0 – P4 are 5 processes present and A, B, C, D are the resources. The maximumneed of a Process and the allocated resources details are given in the table. Answer the following based on banker's algorithm.

(1) What is the content of NEED matrix?

(2) Is the system in a safe state?

(3) If a request from process P0 arrives for (0, 2, 0) can the request be granted immediately.

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	11		2	2	2			
P4	0	024		3	3				

12) Discuss the threading issues which are considered with multithreaded programs.

13) Discuss in detail the critical section problem and also write the algorithm for Readers-WritersProblem with semaphores

14) Explain the FCFS, preemptive and non-preemptive versions of Shortest-Job First and Round Robin (time slice = 2) scheduling algorithms with Gantt charts for the four Processes given. Compare their average turnaround and waiting time.

Process	Arrival Time	Waiting Time
P1	0	10
P2	1	6
P3	2	12
P4	3	15

15) Discuss how deadlocks could be detected in detail.

16) Show how wait() and signal() semaphore operations could be implemented in multiprocessor environments using the test and set instruction. The solution should exhibit minimal busy waiting. Develop pseudo code for implementing the operations.

17) Discuss about the issues to be considered in the multithreaded program.

18) (i) Explain thread and SMP management.
(ii) Illustrate Semaphores with neat example.

19). The current resource allocation state is as shown below:

Process	Current Allocation			Maximum Need		
	R1	R2	R3	R1	R2	R3
P1	2	2	3	3	6	8
P2	2	0	3	4	3	3
P3	1	2	4	3	4	4

Is the current allocation in a safe state?

20) (i) Is it possible to have concurrency but not parallelism? Explain.
(ii) Consider a system consisting of four resources of the same type that are shared by three processes,each of which needs at most two resources. Show that the system is deadlock free.

21) (i) Describe the actions taken by a kernel to context-switch between processes.
(ii) Provide two programming examples in which multithreading does not provide better performancethan a single-threaded solution.

UNIT III CONCURRENCY

PART-A

1. Why page are sizes always powers of 2?
2. What is address binding?
3. What is address binding?
4. Define dynamic loading.
5. Define dynamic linking.
6. What are overlays? Compare swapping and overlays
7. List the strategies for managing free memory in kernel?
8. What is virtual memory? Mention its advantages.
9. Define Demand paging and write advantages.
10. What is the purpose of paging the page tables?
11. What do you mean by thrashing?
12. How do you limit the effects of thrashing?
13. What do mean by page fault?
14. Differentiate between Global and Local page replacement algorithms.
15. Define TLB.
16. Define Pre paging.
17. Define logical address and physical address.

18. What is the main function of the memory-management unit?
19. What is difference between demand paging n pure demand paging?
20. Define Copy-on-write.
21. Define swapping.
22. Define lazy swapper.
23. Define effective access time.
24. What is a reference string?
25. Differentiate a page from a segment.

PART-B

1. Describe the hierarchical paging technique for structuring page tables. (8)
2. What is the cause for thrashing? How does the system detect thrashing? Once it detects, what can the system do to eliminate this problem?
3. Write in detail about Segmentation.
4. Write in detail about Segmentation with Paging.
5. Explain the segmentation with paging implemented in OS/2 32-bit IBM system. Describe the following algorithms:
    a. First fit
    b. Best Fit
    c. Worst Fit
6. Explain how paging supports virtual memory. With a neat diagram explain how logical address is translated into physical address.
7. Explain the principles of segmented and paging implemented in memory with a diagram.
8. Explain the segmentation with paging implemented in MULTICS system.
9. Explain the various page table structures in detail.
10. Write short notes on LRU, FIFO and clock replacement strategies?
11. Explain any four page replacement algorithms in detail?
12. (i)Why page sizes are always powers of 2? (ii)Consider the following segment table:

    Segment Base Length
    i. 0 0219 600
    ii. 1 2300 14
    iii. 2 090 100
    iv. 3 1327 580
    v. 4 1952 96
13. What are the physical addresses for the following logical addresses? 0430 110 2500 400 4112
14. What is thrashing? Explain the working set model in detail.
15. Given memory partitions of 100KB, 500KB, 200KB, 300KB and 600KB(in order), how would each of the first-fit, best-fit and worst-fit algorithms place processes of212KB, 417KB, 12KB and 426KB(in order)? Which algorithm makes the most efficient use of memory?
16. (i) Explain in briefly and compare, fixed and dynamic memory partitioning schemes.
    (ii) Explain FIFO, optimal and LRU page replacement algorithms with an example reference Strings. Mention the merits and demerits of each of the above algorithms.
17. Consider the following page reference string 1,2,3,4,2,1,5,6,2,1,3,7,6,3,2,1,3,6.
    How many page faults would occur for the following replacement algorithms, assuming one, two, three and four frames?
    LRU replacement
    FIFO replacement
    Optimal replacement

18. (i) Consider the following page reference string: 2, 1, 0, 3, 4, 0, 0, 0, 2, 4, 2, 1, 0, 3, 2. How many page faults would occur if the working set policy were used with a window size of 4? Show when each page fault would occur clearly.(ii) What is meant by thrashing? Discuss in detail.
19. Explain the concept of demand paging in detail with neat diagram
20. Why are translation look-aside buffers important? Explain the details stored in a TLB table entry?
21. Consider the following page reference string : 1,2,3,4,2,1,5,6,1,2,3,7,6,3,2,1,2,3,6.How Many page faults would occur for the LRU, FIFO, LFU and optimal page replacement algorithms, assuming two and five frames?
22. Explain the concept of demand paging and the performance issue of short process Explain the issue of demand paging.
23. With a neat sketch, explain how logical address is translated into physical address using paging mechanism?
24. Write short notes on Memory Mapped Files.
25. (i) Consider the following page reference string: 1,2,3,2,5,6,3,4,6,3,7,3,1,5,3,6,3,4,2,4,3,4,5,1
Indicate page faults and calculate total number of page faults and successful ratio for FIFO, optimal and LRU algorithms. Assume there are four frames and initially all the frames are empty.
(ii) Explain the effect of thrashing.
26. Discuss the given memory management techniques with diagrams.
    - Partition Allocation Methods
    - Paging and Translation Look-aside Buffer.
27. (i) Describe a mechanism by which one segment could belong to the address space of two different processes.
(ii) Why are segmentation and paging sometimes combined into one scheme? Explain them in detail with example.
28. (i) Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs.
(ii) Discuss situations in which the least frequently used (LFU) page replacement algorithm generates fewer page faults than the least recently used (LRU) page replacement algorithms.Also discuss under that circumstances the opposite holds good.

UNIT IV MEMORY MANAGEMENT
PART-A

1) What is a file?
2) List the various file attributes.
3) List the various file attributes.
4) What are all the information's associated with an open file?
5) What are the different accessing methods of a file?
6) What is Directory?
7) What are the operations that can be performed on a directory?
8) What are the most common schemes for defining the logical structure of a directory?
9) Define UFD and MFD.
10) What is a path name?
11) What are the various layers of a file system?
12) What are the structures used in file-system implementation?
13) What are the functions of virtual file system (VFS)?
14) Define seek time and latency time.
15) What are the allocation methods of a disk space?
16) What are the advantages of Contiguous allocation?
17) What are the drawbacks of contiguous allocation of disk space?

18) What are the disadvantages of linked allocation?
19) What are the advantages of Indexed allocation?
20) How can the index blocks be implemented in the indexed allocation scheme?
21) What is garbage collection?
22) Mention the objectives of File Management System.
23) What is meant by polling?
24) How free-space is managed using bit vector implementation?
25) Define buffering.

PART-B

1) Explain the different disk scheduling algorithms with examples.
2) Explain and compare FCFS, SSTF, C-SCAN and C-LOOK disk scheduling algorithms with examples.
3) Write short notes on disk management.
4) Write short notes on file system in Linux.
5) Write an elaborate note on RAID and RAID Levels.
6) Explain the services provided by Kernel I/O subsystem.
7) Write short notes on File types, File attributes, File operations
8) Explain the file allocation methods.
9) Explain the role of Access Matrix for protection in files.
10) Write in detail the security measures taken in file system?
11) Write short notes on file system mounting
12) Write in detail about the various file organizations
13) Explain the allocation of frames in detail.
14) Explain directory subsystem
(i) Explain Linked File Allocation method (6)
(ii) Explain the issues in designing a file system. (8)
15)Explain the various file directory structures. (8)
16) (i) Explain the different file access methods in detail. (8)
(ii) Describe the two level and acyclic graph schemes for defining the logical structure of a Directory.
17) Explain the Linked list and indexed file allocation methods with neat diagram. Mention their advantages and disadvantages. (8)
18) What are the most common schemes for defining the logical structure of a directory?
19) Write a brief note on the steps involved in DMA transfer
20) Explain the data structures supported by kernel I/O system
21) Write a brief note on tertiary storage devices
22) Explain different directory implementation methods
23) Why disk scheduling is necessary? Explain the different seek optimization techniques
24) Explain about RAID structure in disk management with various RAID levels of organization in detail
25) Briefly discuss about the various directory structures.
26) Compare the functionalities of FCFS, SSTF, SCAN AND C-LOOK disk scheduling algorithms with an example for each.
27) Write short notes on free space management.
28) (i) Discuss the functions of files and file implementation.
(ii) Explain free space management with neat example.
29) On a disk with 200 cylinders, numbered 0 to 199, compute the number of tracks the disk arm must move to satisfy the entire request in the disk queue. Assume the last request received was at truck 100.

The queue in FIFO order contains requests for the following tracks. 55, 58, 39, 18, 90, 160, 150, 38, 184.Perform the computation to find the seek time for the following disk scheduling algorithms.

- FCFS
- SSTF
- SCAN
- C-SCAN
- LOOK

30) (i) Why it is important to balance file-system I/O among the disks and controllers on a system in a multitasking environment?

(ii) Discuss the advantages and disadvantages of supporting links to files that cross mount points.

31) (i) Explain why logging metadata updates ensures recovery of a file system after a file-system crash.

(ii) Could a RAID level 1 organization achieve better performance for read requests than a RAID level 0 organization? If so, how?

UNIT V STORAGE MANAGEMENT

PART-A

1. What is Linux distribution?
2. What is the use of User mode?
3. What are the components of kernel mode
4. What is process Identity?
5. Define DVK.
6. What is Android?
7. What is the use of firewall manager?
8. Do FAT file system is advantageous? Why?
9. What is the responsibility of kernel in Linux operating system?
10. Why Virtualization is required?
11. State the components of a Linux System?
12. Define the function of Caching-only servers.
13. List out the framework of core OS layer.
14. Define resolver.
15. What is media layer in iOS?

PART-B

1. Explain in detail about the concepts of Linux system.
2. Explain in detail about setting up a Linux mainframe server.
3. Explain in detail about Linux host and adding guest OS
4. Briefly discuss about the requirements to become a Linux system administrator.
7. Discuss about the steps involved in the installation of a Linux Multifunction server.
8. Write a short note on Linux Network Services.
9. Write about LINUX architecture and LINUX kernel with neat sketch.
10. Write about Linux architecture and LINUX kernel with neat sketch.
11. Explain the components of Linux system with neat sketch.
12. How does Linux's Completely Fair Scheduler (CFS) provide improved fairness over a traditional UNIX process scheduler? When is the fairness guaranteed?
13. Explain in detail about architecture and SDK framework for Android Mobile OS.
14. Explain about layers of iOS technology in detail.

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