INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

INFORMATION TECHNOLOGY

TUTORIAL QUESTION BANK

Course Title	**OPERATING SYSTEMS**				
Course Code	AITB04				
Programme	B.Tech				
Semester	IV	CSE | IT			
Course Type	Core				
Regulation	**IARE - R18**				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3		3	-	-
Chief Coordinator	Dr. D Kishore Babu, Associate Professor, CSE				
Course Faculty	Dr.K Suvarchala, Associate Professor Dr.Ch Santaiah, Associate Professor Mrs.Y.Deepthi, Assistant Professor Mr. S.Laxman Kumar, Assistant Professor Mrs. B Pravallika, Assistant Professor Mrs. T Navya, Assistant Professor				

COURSE OBJECTIVES:

The course should enable the students to:	
I	Understand the fundamental principles of the operating system, its services and functionalities.
II	Illustrate the concepts of processes, inter-process communication, synchronization and scheduling.
III	Understand different types of memory management viz. virtual memory, paging and segmentation
IV	Identify the reasons for deadlock and understand the techniques for deadlock detection, prevention and recovery.
V	Understand the need of protection and security mechanisms in computer systems

COURSE OUTCOMES (COs):

CO 1	Describe the concept operating system and operating system design.
CO 2	Determine Process And CPU Scheduling, Process Coordination.
CO 3	An ability to identify and evaluate Memory Management And Virtual Memory
CO 4	To describe the File System Interface, Mass-Storage Structure
CO 5	Understand Deadlocks, Protection.

COURSE LEARNING OUTCOMES (CLOs):

AITB04.01	Describe the structure of operating system and basic architectural components involved in operating system design.
AITB04.02	Describe how the computing resources are managed by the operating system.
AITB04.03	Understand the objectives and functions of modern operating systems.
AITB04.04	Analyze and design the applications to run in parallel either using process or thread models of different operating system
AITB04.05	Understand and analyze implementation of virtual memory
AITB04.06	Understand the various resource management techniques for timesharing and distributed Systems.
AITB04.07	Describe the mutual exclusion, deadlock detection in operating system
AITB04.08	Describe the common algorithms used for both pre-emptive and non-pre-emptive scheduling of tasks in operating systems, such a priority and performance comparison
AITB04.09	Understand the difference between a process and a thread
AITB04.10	Explain the state diagram that describes the states and state transitions during the whole lifetime of a process; likewise, interpret such a state transition diagram
AITB04.11	Identify the mapping between virtual memory address into a physical address
AITB04.12	Explain how a shared memory area can be implemented using virtual memory addresses in different processes
AITB04.13	Identify the need of memory management in operating systems and understand the limits of fixed memory allocation schemes
AITB04.14	Understand the fragmentation in dynamic memory allocation, and identify dynamic allocation approaches
AITB04.15	Understand how program memory addresses relate to physical memory addresses, memory management in base-limit machines, and swapping
AITB04.16	Understand the mechanisms adopted for file distribution in applications
AITB04.17	Describe different Mass storage structure and I/O systems
AITB04.18	Understand issues related to file system interface and implementation, disk management
AITB04.19	Identify the mechanisms adopted for file sharing in distributed applications
AITB04.20	Understand the concepts of Storage Management, disk management and disk scheduling

TUTORIAL QUESTION BANK

	MODULE- I			
	INTRODUCTION			
	Part - A (Short Answer Questions)			
S No	QUESTIONS	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes (CLOs)
1	Describe the use of fork () and exec () system calls.	Remember	CO 1	AITB04.02
2	List any four types of system calls.	Understand	CO 1	AITB04.01
3	Describe multiprocessor system.	Remember	CO 1	AITB04.03
4	List out the advantages of multiprogramming.	Understand	CO 1	AITB04.02
5	Distinguish between multiprogramming and multitasking.	Remember	CO 1	AITB04.02
6	Describe interrupt.	Remember	CO 1	AITB04.02
7	State the virtual machine.	Understand	CO 1	AITB04.01
8	Describe real-time operating system.	Understand	CO 1	AITB04.02
9	Describe operating system.	Remember	CO 1	AITB04.02

10	List out the memory hierarchy available in operating system.	Understand	CO 1	AITB04.02
11	Describe privileged instructions.	Understand	CO 1	AITB04.01
12	Describe the different types of multiprocessing.	Remember	CO 1	AITB04.02
13	Describe the different types of multiprocessor systems.	Understand	CO 1	AITB04.02
14	List out any four functions of operating system.	Understand	CO 1	AITB04.03
15	Describe time-sharing systems.	Remember	CO 1	AITB04.02
16	Illustrate system call.	Understand	CO 1	AITB04.02
17	State the challenges in designing a distributed operating system.	Remember	CO 1	AITB04.01
18	State the differences between system call and system program.	Understand	CO 1	AITB04.02
19	State the five major activities of an operating system in regard to process Management.	Remember	CO 1	AITB04.01
20	State the main advantage of the layered approach to system design. What are the disadvantages of using the layered approach.	Understand	CO 1	AITB04.01
21	List out the contemporary operating systems that use the microkernel approach.	Remember	CO 1	AITB04.01
22	List out the various OS components.	Understand	CO 1	AITB04.01
23	Describe batch systems.	Remember	CO 1	AITB04.02
Part - B (Long Answer Questions)				
1	State and explain various types of computer systems.	Understand	CO 1	AITB04.01
2	Describe an operating system. State and explain the basic functions or services of an operating system. Explain the differences between multiprogramming and time- sharing systems.	Understand	CO 1	AITB04.02
3	Examine how protection is provided for the hardware resources by the operating system.	Remember	CO 1	AITB04.01
4	Describe the system components of an operating system and explain them briefly.	Understand	CO 1	AITB04.01
5	Describe the operating system structures.	Understand	CO 1	AITB04.01
6	Describe the essential properties of the operating systems.	Understand	CO 1	AITB04.03
7	Describe briefly system calls with examples.	Understand	CO 1	AITB04.02
8	Describe the kernel structures of OS.	Remember	CO 1	AITB04.01
9	Describe the architecture of an operating system. Draw and explain the architecture of windows 2000 and traditional UNIX.	Understand	CO 1	AITB04.01
10	Analyze how operating system services are provided by system calls.	Understand	CO 1	AITB04.02
11	Prove an operating system generally need to keep about running processes in order to execute them. Explain in detail.	Remember	CO 1	AITB04.01
12	Describes the view of an operating system as a resource manager.	Understand	CO 1	AITB04.03
13	Distinguish between multiprogramming, multitasking and multiprocessing.	Understand	CO 1	AITB04.02
14	Computer system architecture deals about how the component of a computer system may be organized. Discuss in detail about different architectures of a computer system.	Remember	CO 1	AITB04.01
15	Describe the functionalities listed below. Batch programming Virtual Memory Timesharing	Understand	CO 1	AITB04.02
16	Distinguish between the client-server and peer-to-peer models of distributed systems.	Remember	CO 1	AITB04.02
Part - C (Problem Solving and Critical Thinking Questions)				
1	Describe the distinction between kernel mode and user mode function as a rudimentary form of protection (security) system. Justify.	Understand	CO 1	AITB04.01
2	Demonstrate using a simple system call as an example (e.g. getpid, or uptime), what is generally involved in providing the result, from the point of calling the function in the C library to the point where that function returns.	Understand	CO 1	AITB04.02
3	In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems. Explain two such problems. Can we ensure the same degree of security in a time-shared machine as we have in a dedicated machine. Explain your answer.	Understand	CO 1	AITB04.02
4	Describe why must the operating system be more careful when accessing input to a system call (or producing the result) when the data is in memory	Understand	CO 1	AITB04.02

	instead of registers.			
5	Describe how a multi-threaded application can be supported by a user- level threads package. It may be helpful to consider (and draw) the components of such a package, and the function they perform.	Understand	CO 1	AITB04.01
6	Describe why do you think that idleness in CPU occurs.	Understand	CO 1	AITB04.01
7	Is OS is a resource manager. If so justify your answer	Understand	CO 1	AITB04.03
8	List out the difference between interrupt and exception.	Understand	CO 1	AITB04.01
9	Differentiate between tightly coupled systems and loosely coupled systems.	Understand	CO 1	AITB04.02
10	If you run the same program twice, what section would be shared in the memory Justify	Understand	CO 1	AITB04.01
MODULE-II				
PROCESS AND CPU SCHEDULING,PROCESS COORDINATION				
Part – A (Short Answer Questions)				
1	Describe process. What is the information maintained in a PCB.	Remember	CO 2	AITB04.10
2	Demonstrate process state and mention the various states of a process.	Remember	CO 2	AITB04.10
3	Describe context switching.	Remember	CO 2	AITB04.10
4	Distinguish between user threads and kernel threads.	Understand	CO 2	AITB04.09
5	Distinguish between thread with process.	Understand	CO 2	AITB04.09
6	Describe benefits of multithreaded programming.	Remember	CO 2	AITB04.09
7	Distinguish between preemptive and non-preemptive scheduling techniques.	Understand	CO 2	AITB04.08
8	State critical section problem.	Understand	CO 2	AITB04.07
9	Describe CPU scheduling.	Understand	CO 2	AITB04.08
10	List out the various scheduling criteria for CPU scheduling.	Remember	CO 2	AITB04.08
11	State the assumption behind the bounded buffer producer consumer problem.	Understand	CO 2	AITB04.07
12	Describe turnaround time.	Remember	CO 2	AITB04.08
13	List out different types of scheduling algorithms.	Understand	CO 2	AITB04.08
14	State different ways in which a thread can be cancelled.	Remember	CO 2	AITB04.09
15	State the requirements that a solution to the critical section problem must satisfy.	Understand	CO 2	AITB04.07
16	Describe race condition.	Understand	CO 2	AITB04.07
17	Illustrate semaphores. Mention its importance in operating system.	Remember	CO 2	AITB04.07
18	Describe the use of job queues, ready queues and device queues.	Remember	CO 2	AITB04.10
19	Describe bounded waiting in critical region.	Understand	CO 2	AITB04.07
20	Distinguish between semaphore and binary semaphore.	Remember	CO 2	AITB04.07
21	State the factors on which the performance of the Round Robin CPU scheduling algorithm depends.	Remember	CO 2	AITB04.08
22	Describe entry and exit sections of a critical section.	Understand	CO 2	AITB04.07
23	State the real difficulty with the implementation of the SJF CPU scheduling algorithm.	Remember	CO 2	AITB04.08
24	Describe monitor.	Remember	CO 2	AITB04.07
25	State the algorithms used for foreground and background queue scheduling in a multilevel queue-scheduling algorithm.	Understand	CO 2	AITB04.08
26	State two hardware instructions and their definitions which can be used for implementing mutual exclusion.	Remember	CO 2	AITB04.07
Part - B (Long Answer Questions)				
1	Describe the reasons for process termination.	Understand	CO 2	AITB04.10
2	Illustrate the following process, program, process state, process control block, and process scheduling.	Understand	CO 2	AITB04.10
3	Demostrate the infinite buffer producer/consumer problem for concurrent processing which uses binary semaphores.	Understand	CO 2	AITB04.07
4	Discuss the attributes of the process. Describe the typical elements of process control block.	Remember	CO 2	AITB04.10
5	Describe the principles of concurrency and the execution of concurrent processes with a simple example.	Understand	CO 2	AITB04.10
6	Discuss dining-philosophers problem. Device an algorithm to solve the problem using semaphores.	Understand	CO 2	AITB04.07
7	Illustrate the Readers and Writers problem and its solution using the concept of	Understand	CO 2	AITB04.07

	semaphores.			
8	Describe monitor. Distinguish between monitor and semaphore. Explain in detail a monitor with notify and broadcast functions using an example.	Remember	CO 2	AITB04.07
9	List out the various process states and briefly explain the same with a state diagram.	Understand	CO 2	AITB04.10
10	a) Describe process scheduling. Explain the various levels of scheduling. b) Distinguish pre-emptive and non-pre-emptive scheduling algorithms.	Understand	CO 2	AITB04.08
11	Illustrate the following. a) Process b) Components of process c) Program versus process d) Process states	Remember	CO 2	AITB04.10
12	Discuss the following. a) CPU-I/O burst cycle b) CPU schedule c) Pre-emptive and non-preemptive scheduling d) Dispatcher	Understand	CO 2	AITB04.08
13	Describe the concept of multi-threading. Discuss the following multi- threading models. a) Many-to-one b) One-to-one c) Many-to-many d) Two-level	Remember	CO 2	AITB04.09
14	Discuss the issues that may rise in multi-threading programming. Discuss about each in detail.	Remember	CO 2	AITB04.09
15	Discuss the following CPU scheduling algorithms a) Round robin b) Multilevel- queue scheduling c) Multi-level feedback queue scheduling	Understand	CO 2	AITB04.08
16	A scheduling mechanism should consider various scheduling criteria to realize the scheduling objectives. List out all the criteria.	Understand	CO 2	AITB04.08
17	Illustrate semaphore. Explain the method of application of semaphore for process synchronization.	Remember	CO 2	AITB04.07
18	Enumerate the process state transition diagram with examples.	Remember	CO 2	AITB04.10
19	Discusss the uses of the following: a. Mutex object b. Semaphore object c. Waitable timer object	Understand	CO 2	AITB04.07
20	Express short notes about the following: a. Binary Semaphores b. Bounded Waiting	Remember	CO 2	AITB04.07
Part - C (Problem Solving and Critical Thinking Questions)				
1	Suppose we have a single processor system, and jobs arrive at a rate of 10 jobs a Seconds, suppose each job takes an average of 50 milli-seconds to complete. Assure that both distributions are exponential. **State** the expected number of jobs in the system and the average time in the system.	Understand	CO 2	AITB01.06
2	Suppose the following jobs arrive for processing at the times indicated, each job will run the listed amount of time. Jobs Arrival Time Burst Time (in secs) 1 0.0 8 2 0.4 4 3 1.0 1 Give Gantt chart illustrating the execution of these jobs using the non- pre-emptive FCFS and SJF scheduling algorithms. Interpret the average turnaround time and average waiting time of each job for above algorithms.	Understand	CO 2	AITB01.08
3	Consider system with five processor P0 to P4 and 3 resources A, B and C, Resources type A has 10 instances, B has 5 instances and C has 7 instances. The snapshot at time T0 is	Remember	CO 2	AITB01.06

	ALLOTED MAX A B C A B C P0 0 1 0 7 5 3 P1 2 0 0 3 2 2 P2 3 0 2 9 0 2 P3 2 1 1 2 2 2 P4 0 0 2 4 3 3 Now the process P1 request one additional resource type A and two instances of C. Elucidate whether this new site is safe or not.			
5	Discuss the advantage of using semaphores over Test And Set () and Swap () functions. Describe the use of wait () and signal () functions on semaphore and how these can provide the solution to the Critical section problem.	Understand	CO 2	AITB01.08
6	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 assumed to have arrived in the order p1, p2, p3, p4, p5 all at time 0. a) Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, anon pre-emptive priority (a smaller priority number implies a higher priority) and RR (quantum=1) scheduling. b) Analyze the turnaround time of each process for each of the scheduling algorithms in part. c) Interpret the waiting time of each process for each of the scheduling algorithms in part. Which of the schedules in part a results in the minimal average waiting time.	Understand	CO 2	AITB01.06
7	Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. Interpret how many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm. Do not count the context switches at time zero and at the end	Understand	CO 2	AITB01.10
8	Narrate Four jobs to be executed on a single processor system arrive at time0intheorderA,B,C,D.their burst CPU time requirements are 4,1, 8, 1 time units respectively. The completion time of A under round robin scheduling with time slice of one time unit is.	Understand	CO 2	AITB01.08
	MODULE -III			
	MEMORY MANAGEMENT AND VIRTUAL MEMORY			
	Part - A (Short Answer Questions)			
1	Elucidate the main function of the memory-management unit.	Remember	CO 3	AITB04.13
2	Distinguish between logical address and physical address.	Remember	CO 3	AITB04.11
3	Describe dynamic loading and dynamic linking.	Remember	CO 3	AITB04.14
4	Distinguish between compile time, load time and execution time address binding.	Remember	CO 3	AITB04.13
5	Define swapping.	Remember	CO 3	AITB04.15
6	List dynamic storage allocation strategies in contiguous memory allocation scheme.	Understand	CO 3	AITB04.13
7	Distinguish between MFT and MVT.	Understand	CO 3	AITB04.13
8	Distinguish between internal and external fragmentation.	Understand	CO 3	AITB04.15
9	Describe compaction.	Understand	CO 3	AITB04.15
10	List and define non-contiguous memory allocation schemes.	Remember	CO 3	AITB04.13
	CIE-II			
11	Distinguish between paging and segmentation.	Remember	CO 3	AITB04.12
12	State the purpose of TLB.	Understand	CO 3	AITB04.12
13	Demonstrate the calculation of effective access time of a demand-paged memory system.	Understand	CO 3	AITB04.11

14	Distinguish between page table and inverted page table.	Understand	CO 3	AITB04.12
15	State the benefits of a virtual memory system.	Remember	CO 3	AITB04.11
16	Distinguish between demand paging and pure demand paging.	Remember	CO 3	AITB04.11
17	Distinguish between local and global page replacement strategies.	Understand	CO 3	AITB04.13
18	Illustrate page fault and its effect on the performance of the demand paged memory system.	Understand	CO 3	AITB04.11
19	State the need for page-replacement.	Remember	CO 3	AITB04.13
20	List various page replacement algorithms.	Remember	CO 3	AITB04.13
21	Demonstrate the basic approach of page replacement.	Understand	CO 3	AITB04.12
22	Distinguish between equal and proportional frame allocation strategies.	Remember	CO 3	AITB04.13
23	Illustrate the concept of thrashing and why thrashing should be avoided in a system.	Remember	CO 3	AITB04.15
Part – B (Long Answer Questions)				
1	Describe the following. a) Virtual Memory b) Cache Memory c) Auxiliary Memory	Understand	CO 3	AITB04.11
2	Explain in detail the requirements that memory management technique needs to satisfy.	Understand	CO 3	AITB04.13
3	Describe a) Paging b) Page table structure c) Translation look-aside buffer d) Segmentation	Understand	CO 3	AITB04.12
4	Explain why the “principle of locality” is crucial to the use of virtual memory. What is accomplished by page buffering.	Understand	CO 3	AITB04.12
5	Discuss briefly the swapping concept with necessary examples.	Understand	CO 3	AITB04.15
6	Describe contiguous memory allocation concept with advantages and disadvantages.	Remember	CO 3	AITB04.13
7	Differentiate the main memory organization schemes of contiguous- memory allocation, segmentation, and paging with respect to the following	Remember	CO 3	AITB04.13
8	Differentiate between internal and external fragmentation and Which one occurs in paging scheme.	Understand	CO 3	AITB04.13
9	Explain briefly about paging with neat diagram.	Understand	CO 3	AITB04.12
10	Describe the following a) Hierarchical paging b) Inverted page Tables	Remember	CO 3	AITB04.13
11	Draw and explain the working procedure of paging hardware in detail.	Understand	CO 3	AITB04.12
CIE-II				
11	Elucidate the basic concepts of segmentation with neat diagrams.	Understand	CO 3	AITB04.13
12	Describe page fault. When does a page fault occur. Describe the action taken by OS when page fault occurs.	Understand	CO 3	AITB04.13
13	State and explain about virtual memory concept with neat diagram.	Understand	CO 3	AITB04.12
14	Differentiate between paging and segmentation.	Remember	CO 3	AITB04.13
15	Interpret briefly the performance of demand paging with necessary examples.	Understand	CO 3	AITB04.13
16	Contrast the basic Scheme of page replacement and about the various page replacement strategies with examples.	Remember	CO 3	AITB04.12
17	Discuss the Readers and Writers problem and its solution using the concept of semaphores.	Remember	CO 3	AITB04.13
18	Interpret the uses of the following: a. Mutex object b. Semaphore object c. Waitable timer object	Understand	CO 3	AITB04.15
19	Describe about the following: a. Binary Semaphores b. Bounded Waiting	Remember	CO 3	AITB04.15
20	Elucidate the Readers and Writers problem and its solution using the concept of semaphores.	Remember	CO 3	AITB04.15
21	Illustrate the basic concepts of segmentation with neat diagrams.	Remember	CO 3	AITB04.13
Part – C (Problem Solving and Critical Thinking)				

1	Suppose you have 16M bytes of main memory. Using the list method there is an overhead of 8B per memory block. Using the bitmap method, the allocation granularity is of 128B. How many blocks are there when the space overhead of both methods is the same.Illustrate the average block size for this many blocks.	Remember	CO 3	AITB04.13
2	Consider a computer system supports 32-bit virtual addresses as well as 32- bit physical addresses. Since the virtual address space is of the same size as the physical address space, the operating system designers decide to get rid of the virtual memory entirely.	Understand	CO 3	AITB04.12
3	Consider a CPU generates 32-bit virtual addresses. The page size is 4 KB. The processor has a translation look-aside buffer (TLB) which can hold a total of 128 page table entries and is 4-way set associative. The minimum size of the TLB tag is:	Understand	CO 3	AITB04.13
4	Consider there are 3 page frames which are initially empty. If the page reference string is 1, 2, 3, 4, 2, 1, 5, 3, 2, 4, 6, the number of page faults using the optimal replacement policy is	Understand	CO 3	AITB04.13
5	Consider the following page reference string 7,0,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0 Assuming three frames, how many page faults would occur in each of the following cases. a) LRU b) FIFO c) Optimal algorithms Note that initially all frames are empty.	Remember	CO 3	AITB04.13
	CIE-II			
06	Analyze that we have a paging system with page table stored in memory A. If a memory reference takes 200 nanoseconds how long does a paged B. If we add associative registers and 75% of all page table references are memory reference take found in the associative registers, what is the effective memory reference time. Assume that finding a page table entry in the associative registers takes zero time, if the entry is there.	Understand	CO 3	AITB04.13
07	In two level nested loops, the outer index (i) runs from 1 to 5 and the inner index (j) runs from 1 to 10.The page faults seem to occur for every 7th inner most biterations. If it takes 0.02micro second to load a new page what is the extra time required because of occurrence of page faults.	Remember	CO 3	AITB04.15
08	Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order). Illustrate Which algorithm makes the most efficient use of memory.	Understand	CO 3	AITB04.13
09	Suppose we have a demand paged memory. The page table is held in registers. It takes 8 milliseconds to service a page fault if an empty frame is available or the replaced page is not modified and 20 milliseconds if the replaced page is modified. Memory access time is 100 nanoseconds. Consider that the page to be replaced is modified 70 percent of the time. Demonstrate the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds.	Understand	CO 3	AITB04.12
10	Consider a logical address space of eight pages of 1024 words each mapped onto a physical memory of 32 frames a) Discuss how many bits are in the logical address. b) Discuss how many bits are in the physical address.	Understand	CO 3	AITB04.13
	MODULE –IV			
	FILE SYSTEM INTERFACE,MASS-STORAGE STRUCTURE			
	Part – A (Short Answer Questions)			
1	Elucidate the terms – file, file path, directory.	Remember	CO 4	AITB04.16
2	Distinguish any four common file attributes.	Remember	CO 4	AITB04.16
3	Describe any four file operations.	Remember	CO 4	AITB04.16
4	Distinguish between shared and exclusive lock.	Understand	CO 4	AITB04.16
5	Illustrate the allocation methods of a disk space.	Remember	CO 4	AITB04.17
6	List the bit vector method free space management on disk.	Understand	CO 4	AITB04.17
7	Distinguish the different file accessing methods.	Understand	CO 4	AITB04.16
8	Distinguish the operations that can be performed on a directory.	Remember	CO 4	AITB04.16

9	Describe the most common schemes for defining the logical structure of a directory.	Understand	CO 4	AITB04.16
10	List UFD and MFD..	Remember	CO 4	AITB04.17
11	Describe file system mounting.	Remember	CO 4	AITB04.16
12	State the format of a typical file-control block.	Understand	CO 4	AITB04.17
13	List the different disk-space allocation methods.	Understand	CO 4	AITB04.17
14	List the various layers of a file system.	Understand	CO 4	AITB04.16
15	Demonstrate the functions of virtual file system (VFS).	Understand	CO 4	AITB04.16
16	Describe about different types of disk scheduling.	Understand	CO 4	AITB04.18
17	Describe the terms with respect to disk I/O - seek time, latency time.	Remember	CO 4	AITB04.17
18	List any four common file types and their extensions.	Remember	CO 4	AITB04.16
19	Describe about logical formatting of the disk.	Understand	CO 4	AITB04.18
20	State the advantages of indexed disk-space allocation strategy.	Remember	CO 4	AITB04.17
21	List the different free disk-space management techniques.	Understand	CO 4	AITB04.17
22	Describe the information associated with an open file.	Understand	CO 4	AITB04.16
23	Discuss the advantages of contiguous memory allocation of disk space.	Remember	CO 4	AITB04.18
24	Discuss the drawbacks of contiguous allocation of disk space.	Understand	CO 4	AITB04.18
25	List any four secondary storage memory devices.	Remember	CO 4	AITB04.18
26	State the advantages of linked disk-space allocation strategy.	Understand	CO 4	AITB04.17
27	List various disk-scheduling algorithms.	Understand	CO 4	AITB04.18
28	State the purpose of boot block.	Remember	CO 4	AITB04.18
PART – B (LONG ANSWER QUESTIONS)				
1	a) Discuss the criteria for choosing a file organization. b) Describe indexed file and indexed sequential file organization.	Understand	CO 4	AITB04.16
2	Describe the file system of UNIX.	Understand	CO 4	AITB04.16
3	List the common file types along with their extensions and describe each file type.	Understand	CO 4	AITB04.16
4	Differentiate among the following disk scheduling algorithms. a) FCFS b) SSTF c) SCAN d) C-SCAN e) LOOK f) C-LOOK	Understand	CO 4	AITB04.17
5	a) Demonstrate magnetic disk structure and its management. b) Elucidate swap space management.	Remember	CO 4	AITB04.18
6	Illustrate the following in detail with respect to disk. a) Seek time b) Latency c) Access time d) Transfer time	Remember	CO 4	AITB04.18
7	a) Demonstate in detail the interrupts and interrupt handling features. b) Decribe with neat diagram the steps in DMA transfer.	Understand	CO 4	AITB04.18
8	a) Illustrate the N-step SCAN policy for disk scheduling. b) Demonstrate how double buffering improves the performance than a single buffer for I/O.	Remember	CO 4	AITB04.18
9	a) Express the techniques used for performing I/O. b) Give an example of an application in which data in a file should be accessed in the following order: i. sequential ii. Random	Remember	CO 4	AITB04.18
10	Illustrate the concept and techniques of free space management.	Remember	CO 4	AITB04.20
11	Demonstrate how disk caching can improve disk performance.	Understand	CO 4	AITB04.18
12	Narrate low-level formatting or physical formatting.	Remember	CO 4	AITB04.17
13	Demonstrate buffering, caching and spooling.	Understand	CO 4	AITB04.16
14	Discuss the following a) File system mounting b)Thrashing	Understand	CO 4	AITB04.18

15	Enlist the following file concepts: a) File attributes b) File operations c) File types d) Internal file structure	Remember	CO 4	AITB04.19
16	Discuss the concept of file sharing. What are the criteria to be followed in systems which implement file sharing.	Understand	CO 4	AITB04.18
17	Describe the following Directory Implementation methods. a)Linear List b) Hash Table	Remember	CO 4	AITB04.19
18	Discuss in detail the performance issues of secondary storage management.	Understand	CO 4	AITB04.18
19	Discuss about a) Disk space management b) Swap –space management	Remember	CO 4	AITB04.20
PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)				
1	Suppose we have files F1 to F4 in sizes of 7178, 572, 499 and 1195 bytes. Our disks have fixed physical block size of 512 bytes for allocation. Demonstrate how many physical blocks would be needed to store these four files if we were to use a chained allocation strategy assuming that we need 5 bytes of information to determine the next block in the link. Interpret which file results in the maximum internal fragmentation (measured as a percentage of the file size itself).	Understand	CO 4	AITB04.18
2	Is there any way to implement truly stable storage.Narrate your answer	Understand	CO 4	AITB04.16
3	A hard disk has 63 sectors per tracks, 10 platters each with 2 recording surfaces and 1000 cylinders. The address of a sector is given as a triple < C, h, and s> where c is the cylinder number, h is the surface number and s is the sector number. Thus 0th sector is addressed as <0, 0, and 0>, the 1st sector is Addressed as <0, 0, and 1> and so on. Analyze the address of 1050thsector.	Understand	CO 4	AITB04.18
4	Elucidate the maximum file size supported by a file system with 16 direct blocks, single, double, and triple indirection. The block size is 512 bytes. Disk block numbers can be stored in 4 bytes.	Understand	CO 4	AITB04.18
5	Elucidate the reasons why the operating system might require accurate information on how blocks are stored on disk. how could operating system improves file system performance with this knowledge	Understand	CO 4	AITB04.18
6	Demonstrate how OS could maintain a free-space list for a tape-resident file system. Assume that the tape technology is append-only and that it uses EOT marks and locate, space and read position command	Understand	CO 4	AITB04.16
7	Interpret the diagram, show how an indexed allocation of a file may be done for a disked based system with the following characteristics. The disc size is 30blocks each of 1024 bytes (may be modeled as 6 X 5 matrixes). File f1 is 11 logical records of 112 bytes, file f2 is 890 logical records of 13 bytes, file f3 is 510 bytes of binary data stream and file f4 is 4 logical blocks of 95 bytes.	Understand	CO 4	AITB04.18
8	Illustrate could a RAID level 1 organization achieve better performance for read requests than RAID level 0 organization(with non redundant striping of data). If so, how.	Understand	CO 4	AITB04.18
9	Compare the performance of write operations achieved by a RAID level 5 organization with that achieved by a RAID level 1 organization.	Understand	CO 4	AITB04.20
10	Interpret a disk drive has 5,000 cylinders, numbered 0 to 4,999. The drive is currently serving request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in 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 pending requests for each of the following disk scheduling algorithms. A. FCFS B. SSTF C. SCAN D. C-SCAN E. LOOK F. C-LOOK	Understand	CO 4	AITB04.18

	MODULE -V			
	DEADLOCKS,PROTECTION			
	Part - A (Short Answer Questions)			
1	State Deadlock	Remember	CO 5	AITB04.21
2	Elucidate resource. List some resources that a process might need for its execution.	Understand	CO 5	AITB04.21
3	List the four data structures (matrices) that must be maintained to implement banker's algorithm.	Remember	CO 5	AITB04.22
4	Describe the conditions under which a deadlock situation may arise.	Remember	CO 5	AITB04.21
5	Categorize safe state and unsafe state.	Remember	CO 5	AITB04.21
6	Describe the representation of a resource-allocation graph.	Remember	CO 5	AITB04.22
7	Distinguish between deadlock avoidance and prevention strategies.	Remember	CO 5	AITB04.22
8	Elucidate the purpose of banker's algorithm.	Remember	CO 5	AITB04.22
9	Illustrate the sequence in which a process may utilize the resources in normal mode of operation.	Remember	CO 5	AITB04.21
10	Describe the techniques for recovery from deadlock.	Remember	CO 5	AITB04.22
11	List the goals of protection.	Remember	CO 5	AITB04.23
12	Enumerate any one language-based protection schemes.	Remember	CO 5	AITB04.24
13	Enlist the format of an access matrix.	Understand	CO 5	AITB04.23
14	List the implementation techniques of access matrix.	Remember	CO 5	AITB04.23
15	Describe role-based access control.	Understand	CO 5	AITB04.23
16	List the schemes that implement revocation of capabilities.	Remember	CO 5	AITB04.24
17	Categorize any two example systems that implement capability-based protection.	Understand	CO 5	AITB04.24
18	Describe the terms – object, domain, access right.	Remember	CO 5	AITB04.23
19	Contrast the main differences between capability lists and access lists.	Understand	CO 5	AITB04.24
20	Interpret the protection problems that may arise if a shared stack is used for parameter passing.	Remember	CO 5	AITB04.24
21	State principle of least privilege.	Understand	CO 5	AITB04.24
	Part - B (Long Answer Questions)			
1	Narrate deadlock. What are the four conditions necessary for a deadlock situation to arise. How it can be prevented.	Understand	CO 5	AITB04.21
2	Demonstrate briefly resource allocation graph with examples.	Remember	CO 5	AITB04.22
3	Distinguish the deadlock handling methods.	Understand	CO 5	AITB04.22
4	Illustrate in detail the technique of deadlock avoidance.	Understand	CO 5	AITB04.22
5	Design Banker's algorithm for deadlock avoidance with an example.	Remember	CO 5	AITB04.22
6	Discuss the various issues that need to be considered through the process of revocation of access rights.	Understand	CO 5	AITB04.24
7	State and explain the methods involved in recovery from deadlocks.	Understand	CO 5	AITB04.22
8	Describe resource-allocation graph. Explain how resource graph can be used for detecting deadlocks.	Remember	CO 5	AITB04.22
9	Illustrate the terms. a) Race condition b) Atomic transaction c) Critical section d) Mutual exclusion	Remember	CO 5	AITB04.22
10	Describe how the access matrix facility and role-based access control facility are similar. How do they differ?	Remember	CO 5	AITB04.24
11	Analyze why a capability based system such as Hydra provides greater flexibility than the ring- protection scheme in enforcing protection policies.	Understand	CO 5	AITB04.23
12	Illustrate the following. a) Goals of protection b) Principles of protection	Remember	CO 5	AITB04.23
13	Enumerate about domain of protection.	Understand	CO 5	AITB04.23
14	Elucidate Why do you need to provide protection to the system. Explain how access matrix can be used for the purpose.	Remember	CO 5	AITB04.25
15	Express the access matrix implementation techniques.	Understand	CO 5	AITB04.24
16	Compare the various access matrix implementation techniques.	Remember	CO 5	AITB04.24
17	Demonstrate deadlock detection method in detail.	Understand	CO 5	AITB04.22
18	Express various schemes to implement revocation for capabilities.	Remember	CO 5	AITB04.24

<table>
<tr><td>19</td><td>Describe how language-based protection scheme can be used for providing system protection at kernel level.</td><td>Understand</td><td>CO 5</td><td>AITB04.24</td></tr>
<tr><td>20</td><td>Demonstrate relative merits of compiler-based enforcement based solely on a kernel, as opposed to enforcement provided largely by a compiler.</td><td>Remember</td><td>CO 5</td><td>AITB04.25</td></tr>
<tr><td colspan="5">Part – C (Problem Solving and Critical Thinking)</td></tr>
<tr><td>1</td><td>Consider the following snapshot of a system
<table>
<tr><td></td><td colspan="4">Allocation</td><td colspan="4">Max</td><td colspan="4">Available</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>A</td><td>B</td><td>C</td><td>D</td><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>P1</td><td>0</td><td>0</td><td>1</td><td>3</td><td>0</td><td>0</td><td>1</td><td>2</td><td>1</td><td>5</td><td>2</td><td>0</td></tr>
<tr><td>P2</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>7</td><td>5</td><td>0</td><td></td><td></td><td></td><td></td></tr>
<tr><td>P3</td><td>1</td><td>3</td><td>5</td><td>4</td><td>2</td><td>3</td><td>5</td><td>6</td><td></td><td></td><td></td><td></td></tr>
</table>
Answer the following questions using the banker’s algorithm:
a) Calculate the content of matrix “Need”.
b) Justify the system in a safe state.
c) If a request from process P1 arrives for (0, 4, 2, 0) can the request</td><td>Understand</td><td>CO 5</td><td>AITB04.22</td></tr>
<tr><td>2</td><td>Consider the version of the dining-philosophers problem in which the chopsticks are placed at the center of the table and any two of them can 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 can be satisfied without causing deadlock given the current allocation of chopsticks to philosophers.</td><td>Understand</td><td>CO 5</td><td>AITB04.22</td></tr>
<tr><td>3</td><td>Consider a system consisting of m resources of the same type being shared by n processes. A process can request or release only one resource at a time. Illustrate that the system is deadlock free if the following two conditions hold:
a) The maximum need of each process is between one resource and m resources.
b) The sum of all maximum needs is less than m +n.</td><td>Understand</td><td>CO 5</td><td>AITB04.22</td></tr>
<tr><td>4</td><td>Demonstrate the principle of least privilege aid in the creation of protection systems.</td><td>Understand</td><td>CO 5</td><td>AITB04.24</td></tr>
<tr><td>5</td><td>Describe how the Java protection model would be compromised if a Java program were allowed to directly alter the annotations of its stack frame.</td><td>Remember</td><td>CO 5</td><td>AITB04.25</td></tr>
<tr><td>6</td><td>Interpret the Coffman's conditions that lead to a deadlock.</td><td>Remember</td><td>CO 5</td><td>AITB04.21</td></tr>
<tr><td>7</td><td>A system has n resources R_0... R_{n-1},and k processes P_0,... P_{k-1}.The implementation of the resource request logic of each process P_i is as follows:
if (i % 2 == 0)
{
if (i < n) request Ri
if (i+2 < n) request Ri+2
}
else
{
if (i < n) request Rn-i
if (i+2 < n) request Rn-i-2
}</td><td>Understand</td><td>CO 5</td><td>AITB04.22</td></tr>
<tr><td>8</td><td>A system contains three programs and each requires three tape units for its operation. Calculate the minimum number of tape units which the system must have such that deadlocks never arise is.</td><td>Remember</td><td>CO 5</td><td>AITB04.21</td></tr>
<tr><td>9</td><td>A system has 6 identical resources and N processes competing for them. Each process can request at most 2 resources. Interpret which one of the following values of N could lead to a deadlock.</td><td>Remember</td><td>CO 5</td><td>AITB04.22</td></tr>
<tr><td>10</td><td>Two shared resources R_1 and R_2 are used by processes P_1 and P_2. Each process has a certain priority for accessing each resource. Let T_{ij} denote the priority of P_i for accessing R_j. A process P_i can snatch a resource R_h from process P_j if T_{ik}</td><td>Understand</td><td>CO 5</td><td>AITB04.22</td></tr>
</table>

	is greater than T_{jk}. Given the following: 1. $T_{11} > T_{21}$ 2. $T_{12} > T_{22}$ 3. $T_{11} < T_{21}$ 4. $T_{12} < T_{22}$ Demonstrate which of the following conditions ensures that P_1 and P_2 can never deadlock.			

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