Hall Ticket No | | | | | | | | | | | Question Paper Code: AITB04

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER - I

B.Tech IV Semester End Examinations (Regular), May – 2019

Regulations: IARE-R18

OPERATING SYSTEMS

(Computer Science and Engineering)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. a) Explain the following Computer-system architecture: **[7M]**
   i. Single processor systems
   ii. Multi processor systems
   iii. Clustered systems
   b) Explain the types of system calls provided by the operating system? **[7M]**
2. a) Explain various services of operating system? **[7M]**
   b) List any five major activities of an operating system with regard to process management and three major activities with regard to memory management? **[7M]**

UNIT – II

3. a) Write short notes on the following with respect to process: **[7M]**
   i. Process states with state diagram
   ii. Process control block (PCB)
   b) Explain the FCFS, preemptive and non preemptive versions of Shortest-Job-First anf Round Robin (time slice = 2) scheduling algorithms with Gantt Chart for the four processes given. Compare their average turn around and waiting time. **[7M]**

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

4. a) State Dining Philosopher's problem and give a solution using semaphores? **[7M]**
   b) 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. **[7M]**

UNIT – III

5. a) With a neat sketch, explain how logical address is translated into physical address using Paging mechanism. **[7M]**

b) Consider the following page reference string 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 4, 5, 3. List out the number of page faults for the following page replacement algorithms? Assume four frames and all frames are initially empty. **[7M]**

i. LRU replacement
ii. FIFO replacement
iii. Optimal replacement

6. a) Explain any two page replacement algorithms by taking suitable example? **[7M]**

b) Explain the following: **[7M]**

i. Segmentation vs. paging
ii. Logical address space vs. physical address space
iii. Internal fragmentation vs. external fragmentation

UNIT – IV

7. a) Explain different file operations and file attributes? **[7M]**

b) Write in detail about the on-disk and in-memory structures used to implement a file system? **[7M]**

8. a) With diagram explain tree structured directory and two level directory structures? **[7M]**

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 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 that the disk arm moves to satisfy the pending requests for each of the following disk scheduling algorithm: **[7M]**

i. FCFS
ii. SSTF
iii. C-SCAN

UNIT – V

9. a) Discuss different methods of implementation of Access Matrix? **[7M]**

b) Distinguish between system protection and system security? **[7M]**

10. a) Define deadlock. List the necessary conditions for deadlock? **[7M]**

b) Consider the following snapshot of a system: **[7M]**

Process	Current Allocation			Maximum Allocation			Resources Available		
	A	B	C	A	B	C	A	B	C
P1	0	1	0	7	5	3	3	3	2
P2	2	0	0	3	2	2			
P3	3	0	2	9	0	2			
P4	2	2	1	2	2	2			
P5	0	0	2	4	3	3			

Using Banker's algorithm, find:

i. Write is the content of the need matrix?
ii. Is the system in a safe state?
iii. Is request from P1 = (1, 0, 2) and then request from P4 = (3, 3, 0) can be granted or not?

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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:

I	Describe the concept operating system and operating system design
II	Determine Process And CPU Scheduling, Process Coordination
III	An ability to identify and evaluate Memory Management And Virtual Memory
IV	To describe the File System Interface, Mass-Storage Structure
V	Understand Deadlocks, Protection and dead lock starvation.

COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the asking to do the following:

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

MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES:

SEE Question Number		COURSE LEARNING OUTCOME		Course Outcomes	Blooms Taxonomy Level
1	a	AITB04.01	Describe the structure of operating system and basic architectural components involved in operating system design.	CO 1	Understand
	b	AITB04.02	Describe how the computing resources are managed by the operating system.	CO 1	Understand
2	a	AITB04.03	Understand the objectives and functions of modern operating systems.	CO 1	Remember
	b	AITB04.02	Describe how the computing resources are managed by the operating system.	CO 1	Remember
3	a	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	CO 2	Understand
	b	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	CO 2	Understand
4	a	AITB04.06	Understand the various resource management techniques for timesharing and distributed systems.	CO 2	Understand
	b	AITB04.06	Understand the various resource management techniques for timesharing and distributed systems.	CO 2	Understand
5	a	AITB04.15	Understand how program memory addresses relate to physical memory addresses, memory management in base-limit machines, and swapping	CO 3	Understand
	b	AITB04.15	Understand how program memory addresses relate to physical memory addresses, memory management in base-limit machines, and swapping	CO 3	Understand
6	a	AITB04.15	Understand how program memory addresses relate to physical	CO 3	Remember
	b	AITB04.14	Understand the fragmentation in dynamic memory allocation, and identify dynamic allocation approaches.	CO 3	Remember
7	a	AITB04.16	Understand the mechanisms adopted for file distribution in applications	CO 4	Understand
	b	AITB04.19	Identify the mechanisms adopted for file sharing in distributed applications	CO 4	Understand
8	a	AITB04.17	Describe different Mass storage structure and I/O systems	CO 4	Remember
	b	AITB04.18	Understand issues related to file system interface and implementation, disk management	CO 4	Understand
9	a	AITB04.18	Understand types of security risks in operating system and the role of operating system in establishing security	CO 5	Remember
	b	AITB04.19	Identify different protection and security mechanisms in operating system	CO 5	Understand
10	a	AITB04.20	Understand the concept of deadlock in operating systems and how they can be implemented in multiprogramming system	CO 5	Understand
	b	AITB04.20	Identify how deadlock can occur and know how it can be prevented or avoided	CO 5	Remember

HOD, CSE