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III B. Tech I Semester Regular Examinations, Dec/Jan – 2022-23
OPERATING SYSTEMS
CSE(AIML),CSE(AI),CSE(DS),CSE(AIDS),AIDS,AIML

Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Explain the key functions of an Operating System. [7M]
    b) What is Open source software? And discuss its advantages and disadvantages. List out some Open-Source operating systems. [7M]

(OR)

2. a) Discuss the major operations of the Operating system. [7M]
    b) With a neat diagram, demonstrate the layered structure of Operating System. [7M]

UNIT-II

3. a) What is the necessity of Context switching? What information is saved during Context switching? Explain the actions taken by a kernel to context switch between processes. [7M]
    b) Four jobs to be executed on a single processor system arrive at time 0 seconds in the order A, B, C, D. Their burst CPU time requirements are 4, 1, 8, 1 time units respectively. Draw a Gantt chart illustrating the execution of these jobs using Shortest Remaining Time First scheduling algorithm and also Calculate the average waiting and turnaround times. [7M]

(OR)

4. a) Discuss the different approaches for Inter- Process Communication. [7M]
    b) What is critical section in Readers-Writer's problem? Suggest a fair solution for the Readers-Writers problem. [7M]

UNIT-III

5. a) What is the main purpose of Memory Swapping? What handles process Swapping in OS? Differentiate between Swapping and Paging. [7M]
    b) Explain in detail about how Virtual memory is implemented with a neat diagram. [7M]

(OR)

6. a) What is the need for page replacement in paging? Describe any 3 page replacement algorithms with examples. [10M]
    b) Explain about Memory-mapped files and its types. [4M]

UNIT-IV

7. a) What is Deadlock and what are its four necessary conditions? Specify the difference between Deadlock and Starvation. [7M]
    b) Briefly explain about Single-level, Two-level and Tree-Structured directory implementations. [7M]

(OR)

8.   a)   Explain Banker's algorithm with an example.   [7M]

       b)   Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The head is initially at cylinder number 53. The cylinders are numbered from 0 to 199. Find out the total head movement (in number of cylinders) incurred while servicing these requests with respect to SSTF and CLOOK algorithms.   [7M]

UNIT-V

9.   a)   Explain the different types of Program Threats.   [7M]

       b)   Explain the implementation of access control list and access control matrix.   [7M]

(OR)

10.   a)   Discuss the goals and principles of protection in a modern computer system.   [7M]

       b)   Describe the features of Linux and Microsoft Windows.   [7M]

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UNIT-I

1. a) What is an Operating System? Briefly discuss its functions and types. [7M]
   b) Explain the different types of System calls in OS. [7M]

(OR)

2. a) Explain the major activities of Operating System in connection with process and memory management. [7M]
   b) Write the steps of Booting process in Operating System and discuss is types. [7M]

UNIT-II

3. a) Explain the role of Process Control Block in Operating System and describe its attributes. [4M]
   b) Write the important characteristics of Round Robin Scheduling algorithm. And illustrate its performance by drawing Gantt chart for the following workload in a system. (Assume time quantum = 3 units) [10M]

Process	Arrival Time	Burst Time
P1	5	5
P2	4	6
P3	3	7
P4	1	9
P5	2	2
P6	6	3

(OR)

4. a) State the Dining philosopher's problem. How Semaphores can be used to provide a solution to Dining philosopher's problem? Explain. [10M]
   b) Explain the Message passing model of Inter-process communication. [4M]

UNIT-III

5. a) How does fragmentation occur in contiguous memory allocation? Explain with an example. [7M]
   b) Explain the working of Demand Paging technique. And name the hardware required to support demand paging. [7M]

(OR)

1 of 2

6. a) A system uses 3 page frames for storing process pages in main memory. It uses the Least Recently Used replacement policy. Assume that all the page frames are initially empty. What is the total number of page faults that will occur while processing the page reference string given below? [7M]

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

    Also calculate the hit ratio and miss ratio

    b) What is Thrashing? What is the cause of Thrashing? How does the system detect Thrashing? What can the system do to eliminate this problem? [7M]

UNIT-IV

7. a) Why Ostrich algorithm is considered the best solution for deadlock handling? Explain the Ostrich algorithm. [7M]

    b) Explain the following [7M]
    i)File System implementation
    ii)Stable storage implementation

(OR)

8. a) Discuss the different ways of aborting a process in order to eliminate deadlocks. [7M]

    b) Suppose the following disk request sequence (track numbers) for a disk with 200 tracks is given: 82,170,43,140,24,16,190. Assume that the initial position of the R/W head is on track 50. Calculate the Seek Time for SSTF, SCAN, LOOK [7M]

UNIT-V

9. a) Discuss various System threats endangering the security of a system. [7M]

    b) Explain the core components of Linux operating system. [7M]

(OR)

10. a) What is a Firewall and how does it protect Systems and Networks? [7M]

    b) Discuss the types of Access and Access controls in Operating System. [7M]

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UNIT-I

1. a) Explain the major activities of an operating system in regard to File and Device management. [10M]
   b) Describe the Booting process and Debugging in Operating System. [4M]

(OR)

2. a) Describe the history and evolution of Operating systems. [7M]
   b) Briefly discuss the types of System calls in Operating Systems. [7M]

UNIT-II

3. a) Discuss the different types of Multithreading models in Operating System. [7M]
   b) Describe the characteristics of SJF scheduling algorithm. [7M]
   Consider there are five jobs named as P1, P2, P3, P4 and P5.
   Their arrival time and burst times are given below.

Process	Arrival Time	Burst Time
P1	1	7
P2	3	3
P3	6	2
P4	7	10
P5	9	8

   Draw a Gantt chart illustrating the execution of these jobs using SJF algorithm and also Calculate the average waiting time and average turnaround time.

(OR)

4. a) Explain the following [7M]
   i)Race Condition　　　ii)Critical section　　　iii)Monitors
   b) State the Dining philosophers problem and give a solution for the same using semaphores, Write the structure of philosopher 'i'. [7M]

UNIT-III

5. a) Explain about Segmentation and illustrate the translation of Logical address into Physical address by segment table. [7M]
   b) Explain the Copy-on-write technique and its benefits. [7M]

(OR)

6. Consider the following page reference string: [14M]
   1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6
   How many page faults would occur for FIFO, LRU and optimal page replacement algorithms assuming four page frame and all frames are initially empty.

UNIT-IV

7.   a)   Explain and compare the FCFS and SSTF disk scheduling algorithms.   [7M]

    b)   Discuss the different levels of RAID configuration.   [7M]

(OR)

8.   Consider a system that contains five processes P1, P2, P3, P4, P5 and the three resource types A, B and C. Following are the resources types: A has 10, B has 5 and the resource type C has 7 instances.   [14M]

Process	Allocation			Max			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	1	1	2	2	2			
P5	0	0	2	4	3	3			

Answer the following questions using the banker's algorithm:

1. What is the reference of the need matrix?

2. Determine if the system is safe or not.

3. What will happen if the resource request (1, 0, 0) for process P1 can the system accept this request immediately?

UNIT-V

9.   a)   What are the goals of System Security? Describe various threats to the operating system.   [7M]

    b)   What does the Access control matrix represent? Explain the implementation of Access control matrix.   [7M]

(OR)

10.   a)   How is Cryptography used for System Security and Authentication?   [7M]

     b)   What are the features of firewall? How firewall protect the System or Network?   [7M]

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UNIT-I

1. a) Explain the major activities of an operating system in regard to device and file management. [7M]
   b) Describe various system program and system booting in detail. [7M]

(OR)

2. a) Explain the Layered structure of Operating System. [7M]
   b) Why do you need system calls in Operating System? List out and explain various examples of Windows and Unix system calls. [7M]

UNIT-II

3. a) What is inter-process communication in OS? Explain the role of Synchronization in Inter Process Communication. [7M]
   b) Write the important characteristics of Round Robin Scheduling algorithm. And demonstrate its performance for the following workload in a system with time quantum = 2 units. [7M]

   Consider the set of 5 processes whose arrival time and burst time are given below

Process	Arrival Time	Burst Time
P1	0	5
P2	1	3
P3	2	1
P4	3	2
P5	4	3

   Draw a Gantt chart illustrating the execution of these jobs and also Calculate the average waiting and turnaround times.

(OR)

4. a) Explain the following [6M]
   i)Race condition   ii)Critical Section   iii)Mutual Exclusion
   b) Explain how semaphores can be used to deal with n-process critical section problem. [8M]

UNIT-III

5. a) Write the advantages and disadvantages of Contiguous and Non-Contiguous memory allocation in OS. [7M]
   b) What is Thrashing? What is the cause of Thrashing? How does the system detect Thrashing? What can the system do to eliminate this problem? [7M]

(OR)

6.   a)   Discuss the strategies for managing free memory that is assigned to kernel processes.   [4M]

    b)   Consider a main memory with five page frames and the following sequence of page references:
3, 8, 2, 3, 9, 1, 6, 3, 8, 9, 3, 6, 2, 1, 3
Find the number of page faults and hits with respect to page replacement policies FIFO and LRU.   [10M]

UNIT-IV

7.   a)   What is Deadlock? Explain three major approaches for handling deadlocks.   [7M]

    b)   Explain Indexed file allocation method. Also discuss its merits and demerits.   [7M]

(OR)

8.   a)   Describe various In-memory and On-Disk structures supporting file system implementation.   [7M]

    b)   Why is Disk Scheduling needed? Explain the following terms related to disk scheduling.
i)Seek Time   ii)Rotational Latency   iii)Transfer Time
iv)Disk Access Time   v)Disk Response Time   [7M]

UNIT-V

9.   a)   What are the various ways to ensure Operating System security? Briefly explain each of them.   [7M]

    b)   How does a Firewall work? Discuss its key uses and types.   [7M]

(OR)

10.   a)   Explain the Domain protection mechanism in detail.   [7M]

    b)   Summarize the Computer Security classification.   [7M]