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ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APRIL/MAY 2025

B.Tech Information Technology

IV Semester

IT5403 Operating Systems

(Regulation2019)

Time:3hrs Max.Marks: 100

CO1	Articulate the main concepts, key ideas, strengths and limitations of operating systems.
CO2	Analyze the structure and basic architectural components of OS.
CO3	Design various scheduling algorithms
CO4	Understand various file management systems
CO5	Design and implement memory management schemes. Acquire a detailed understanding of various aspects of I/O management

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)

Q.No.	Questions	Marks	CO	BL
1	List down the sequence of actions taken by the kernel during context switch.	2	CO1	L1
2	How can a parent and child process communicate using a pipe after fork()?	2	CO1	L2
3	Write a bounded buffer monitor in which the buffers are embedded within the monitor itself.	2	CO2	L1
4	What is the difference between multilevel and multilevel feedback CPU scheduling mechanisms?.	2	CO2	L2
5	What is the difference between sequential and direct access methods in file systems?	2	CO3	L2
6	Name two common directory structures and explain one advantage of each.	2	CO3	L1
7	Assume the Memory access time is 100ns, TLB access time is 10ns and TLB hit ratio is 75%. Calculate the effective memory access time.	2	CO4	L3
8	State the effect of Thrashing in the performance of an operating system.	2	CO4	L1
9	Explain the purpose of disk formatting.	2	CO5	L1
10	What is a boot block and where is it located on a disk?	2	CO5	L1

PART- B(5x 13=65Marks)

Q.No.	Questions	Marks	CO	BL
11 (a)	i. Explain operating system structure in detail and List the types of System calls? ii. How single core and multicore processors handles fork () system call with wait () and without wait () in the parent process? Why the execution of parent and child process is not deterministic?	8 5	CO1	L2
	OR			
11 (b)	i. Using IPC technique explain how two processes without having any ancestral relationship can communicate with each other. ii. Write a note on 1. System calls. 2. Software Virtualization	8 5	CO1	L2
12 (a)	i. Apply FCFS, SJF, STRJ and priority (low value implies high priority) scheduling. Find waiting and turnaround time of the process? Process Arrival time Burst time priority PI 5 3 1 P2 9 2 3 P3 12 1 2 P4 13 15 1 P5 18 17 1	8 5	CO2	L4

	ii. Write the suitable pseudo code to represent the structure of a process Pi and explain how Peterson's solution is preserving the mutual exclusion requirement?			
	OR			
12 (b)	**i.** The following processes are being scheduled using a preemptive, priority-based, round-robin scheduling algorithm. Process Priority Burst_Time Arrival_Time *P*1 8 15 0 *P*2 3 20 0 *P*3 4 20 20 *P*4 4 20 25 *P*5 5 5 45 *P*6 5 15 55 Each process is assigned a numerical priority with a higher number indicating a higher relative priority. The scheduler will execute the highest priority process. For processes with the same priority, a round-robin scheduler will be used with a time quantum of 10 units. If a process is preempted by a higher-priority process, the preempted process is placed at the end of the queue. a. Show the scheduling order of the processes using a Gantt chart and explain? b. What is the turnaround time for each process? c. What is the waiting time for each process? d. What is the CPU utilization rate? ii. Explain two primitive semaphore operations? Write a solution to producer-consumer problem using semaphores?	**8** **5**	CO2	L4
13 (a)	i. Explain various logical structures of file system directory in detail. State their advantages and disadvantages. ii. Compare the various File system allocation methods in terms of access schemes, memory usage and efficiency.	**8** **5**	CO3	L2
	OR			
13 (b)	Discuss the various file allocation methods in detail.	**13**	CO3	L2
14 (a)	i. Consider the reference string 1,2,3,4,2,3,5,6,2,1,2,3,7,6,3,3,1,2,3,6. Compute the number of page faults for FIFO, Optimal Page Replacement and LFU policies. Assume 4 initial free frames. ii. State the cause of thrashing. How can it be minimized?	**8** **5**	CO4	L3
	OR			
14 (b)	i. What is the purpose of a page table and TLB in paging scheme? Explain them with the help of block diagrams? ii) Describe the actions taken by the operating system when a page fault occurs?	**8** **5**	CO4	L3
15 (a)	Explain and apply various disk-scheduling algorithms to schedule the following requests for cylinders 89, 138, 73, 122, 19, 142, 56, 67. Assume that the head starts at cylinder 35. Specify which algorithm is the most suitable for this disk queue with proper justification	**13**	CO5	L3
	OR			
15 (b)	i. Compare the various free space management approaches in terms of their efficiency and performance of utilizing the system memory. ii. Write a detail note on STREAMS.	**8** **5**	CO5	L3

PART- C(1x 15=15Marks)

Q.No.	Questions	Marks	CO	BL
16.	i. Given six memory partitions of 300KB, 600KB, 350KB, 200KB, 750KB and 125KB, how would the First-Fit, Best-Fit and Worst-Fit algorithms place processes of size 115KB, 500KB, 358KB, 200KB and 375KB? Rank the algorithms in terms of the efficiency of memory usage. ii. Explain how wait() and signal() semaphore operations in multiprocessor environments using the test_and_set() instructions exhibit minimal busy waiting.	**10** **5**	CO2, CO4	L5