ANNA UNIVERSITY (University Departments)
B.E (Full Time) END SEMESTER EXAMINATIONS – April /May 2025
Computer Science and Engineering
CS6108 OPERATING SYSTEMS
(Regulation 2018 - RUSA)

Time: 3 Hours Max. Marks 100

CO 1	Articulate the main concepts, key ideas, strengths and limitations of Operating Systems
CO 2	Analyze the structure and basic architectural components of OS
CO 3	Elaborate and design various scheduling algorithms
CO 4	Discuss various memory management schemes and design them
CO 5	Point out the various aspects of storage management

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analyzing, L5 - Evaluating, L6 -Creating)

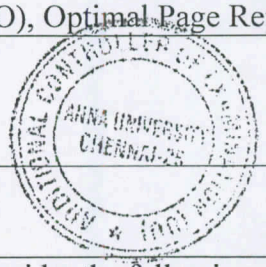
PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No.	Questions	Marks	CO	BL
1.	Define an Operating System and explain its primary functions	2	1	L1
2.	Distinguish between internal vs external fragmentation	2	2	L3
3.	What is an atomic operation? What is indivisibility of an operation execution?	2	2	L2
4.	What are system calls? State their purpose.	5	1	L3
5.	What is cascading termination?	2	4	L2
6.	What is the role of the Translation Lookaside Buffer (TLB) in paging?	2	3	L3
7.	Which are the conditions that may lead a process to a deadlock state?	2	3	L1
8.	Define Thrashing.	2	5	L3
9.	What are the three common file access methods?.	2	5	L3
10.	What is memory mapping of a file in Linux environment?	2	4	L2

PART- B (8 x 8 = 64 Marks)
Answer any **eight** questions

Q. No.	Questions	Marks	CO	BL
11.	Describe the various multithreading models used in operating systems. Explain how each model manages the relationship between user-level threads and kernel-level threads.	8	1	L2
12.	Explain the following process-related concepts i. Process states and the role of the Process Control Block (PCB) ii. Process scheduling and the different types of schedulers iii. Context switching and its importance in multitasking iv. Inter-Process Communication (IPC) mechanisms	8	1	L1
13.	Explain the key services provided by an operating system and describe how virtualization enhances system operations.	8	2	L3

14.	Explain the concept of paging in memory management. Illustrate with a neat diagram.	8	2	L2
15.	Write shortly about the system calls- exec(), wait(), open(), close(), fork (), read (), write ()	8	3	L3
16.	Given memory partitions of sizes 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order), how the first-fit algorithm allocate memory to processes requiring 212 KB, 417 KB, 112 KB, and 426 KB? Illustrate the allocation and the status of each memory blocks finally	8	3	L4
17.	Describe the implementation of Inter-Process Communication using POSIX Shared Memory.	8	5	L2
18.	Write short notes on the following: a. SSTF b. SCAN c. C-SCAN	8	5	L3
19.	Explain the different file access methods available in operating systems. Provide examples for each method to illustrate their functionality.	8	4	L3
20.	Explain the concept of paging with segmentation in memory management. Illustrate with a neat sketch and describe its working mechanism.	8	4	L2
21.	Explain the different process synchronization tools Mutex Locks, Semaphores, and Monitors.	8	3	L4
22.	Consider the following page reference string: 2, 3, 4, 2, 1, 5, 6, 4, 1, 2, 3, 7, 6, 3, 2, 1 Calculate the number of page faults that would occur for the following page replacement algorithms, assuming a frame size of 4 frames: First-In-First-Out (FIFO), Optimal Page Replacement (OPT), Least Recently Used (LRU).	8	5	L3



PART- C (2 x 8 = 16 Marks)
(Answer all questions)

Q. No.	Questions	Marks	CO	BL
23.	Consider the following workload of processes that arrive at time 0 with the given CPU burst times (in milliseconds): **Process** / **Burst Time (ms)** P1 / 10 P2 / 29 P3 / 3 P4 / 7 P5 / 12 Analyze the performance of the following CPU scheduling algorithms: First-Come-First-Serve (FCFS), Shortest Job First (SJF), Round Robin (RR) with a quantum of 10 ms. Which algorithm gives the minimum average waiting time?	8	4	L3
24.	A barbershop has 5 waiting chairs and 1 barber chair. If no customers are present, the barber sleeps. A new customer leaves if all chairs are full; otherwise, they sit and wait. If the barber is asleep, the customer wakes him up. Explain the critical section problem and write the semaphore-based solution.	8	3	L4