Register No.: .... Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 2023
COMPUTER SCIENCE AND ENGINEERING
(2020 SCHEME)

Course Code :   **20CST206**

Course Name: **Operating Systems**

Max. Marks :   **100**   **Duration: 3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Explain the need for system calls in Operating System. Give an example of system call used in process management.
2. Differentiate between single processor and multiprocessor systems.
3. Explain the different fields in a Process Control Block (PCB).
4. How indefinite blocking can be solved in priority scheduling.
5. Explain the conditions to be satisfied to ensure solution to critical section problem.
6. Explain wait() and signal(). How is busy waiting eliminated in Semaphores?
7. Explain demand paging with its advantages.
8. Differentiate logical address and physical address with an example.
9. Explain any three file attributes.
10. Define the terms i) Seek time ii) Rotational delay iii) Disk bandwidth.

PART B
(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Explain any four functions of an Operating System. (8)
    b) Differentiate between Layered and Micro kernel design of Operating System. (6)

OR

12. a) Distinguish between kernel mode and user mode functions. (8)
    b) Explain any three services provided by an Operating System. (6)

MODULE II

13. a) Explain the different Inter Process Communication (IPC) mechanisms in detail. (7)

b) Assume you have the following jobs shown in the table to execute with one processor. Calculate the average waiting time and average turnaround time if the system uses RR Scheduling and the time slice is 4ms.

Process	Arrival Time (ms)	Burst Time (ms)
P1	11	0
P2	13	5
P3	6	9
P4	9	13
P5	12	17

(7)

OR

14. a) With the help of a diagram, explain the different process states. (5)

b) Draw the Gantt Chart , find the average waiting time for the following algorithms

   a) FCFS   b) Pre-emptive Priority   c) Non-preemptive priority

Process	Arrival Time (ms)	Burst Time (ms)	Priority
P1	0	8	4
P2	2	6	1
P3	2	1	2
P4	1	9	2
P5	3	3	3

(9)

MODULE III

15. a) Explain the term deadlock and what are the four necessary conditions for a deadlock to occur? (5)

b) Consider a system with four processes P1, P2, P3, P4, and four types of resources R1, R2, R3, R4. The maximum no: of instances of resources of each type are 5, 7, 7 and 7 respectively. What will be the order of processing of jobs if the allocated matrix and the maximum claim (that each process can claim) matrix are as given below. (9)

	Allocated Matrix				Maximum Claim			
	R1	**R2**	**R3**	**R4**	**R1**	**R2**	**R3**	**R4**
P1	2	1	3	2	3	5	6	4
P2	0	0	1	2	1	3	4	6
P3	1	2	1	1	1	4	3	2
P4	1	1	0	2	2	3	1	2

OR

16. a) Define semaphore with its operations. What are the two types of Semaphores?   (9)

    b) Show that if the wait and signal operations are not executed atomically then mutual exclusion may be violated.   (5)

MODULE IV

17. a) Consider the following page reference string:
    7,2,3,1,2,5,3,4,6,7,7,1,0,5,4,6,2,3,0,1.
    Assuming demand paging with three frames, how many page faults would occur for the following page replacement algorithms.   (9)
         i) LRU replacement
         ii) FIFO replacement
         iii) Optimal replacement

    b) With a diagram, explain how paging is done with TLB.   (5)

OR

18. a) How is swapping done? Explain with the help of a diagram.   (6)

    b) Explain the steps involved in handling a page fault.   (8)

MODULE V

19. a) The read write head is at 97. The head is moving from 299 to 0. Requests are in the order 94, 82, 101, 110, 198, 75, 87, 124, 136. How much time is required by the system if the system is following: (9)
         i) Shortest seek time first.
         ii) C-Scan.
         iii) Elevator algorithm.
    Assume 1 head movement takes 1 ms.

    b) Explain any two file allocation methods   (5)

OR

20.   a)   Compare sequential access and direct access methods of storage
           devices.   (6)

      b)   What is the use of access matrix in protection mechanism?   (8)

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