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SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 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. List out the main functions of an Operating system?
2. Explain about system boot process.
3. What are threads? Why are they called light weight processes?
4. Explain the different states of a process during its life span?
5. What is a resource allocation graph? Give an example.
6. What are the three requirements to be satisfied for the solution of critical section problems?
7. What is thrashing? What are the causes of thrashing?
8. Differentiate between internal and external fragmentation.
9. Explain about single level, two level and tree structured directories.
10. Define seek time and latency time.

PART B

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

MODULE I

11. a) Write a short note on: (9)
    i) Layered operating system
    ii) Monolithic operating system
    iii) Microkernel operating system
    b) Explain in detail about Batch system and Multiprocessor system. (5)

OR

12. a) Define system call. Explain any five types of system call and give examples for each. (12)

b) A process executes the following code fragment: (2)

```
for(i=0;i<5;i++)
    fork( );
```

Compute the number of child process created.

MODULE II

13. a) Describe the makeup of the process control block. (8)

b) Differentiate between short term, medium term, and long-term schedulers. (6)

OR

14. Consider the following set of processes, with the length of the CPU burst given in milliseconds: (14)

Process	Burst Time	Priority
P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

i) Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, non-preemptive priority (a larger priority number implies a higher priority), and RR (quantum = 2).

ii) What is the turnaround time of each process for each of the scheduling algorithms in part a?

iii) What is the waiting time of each process for each of these scheduling algorithms?

iv) Which of the algorithms results in the minimum average waiting time (over all processes)?

MODULE III

15. a) Assume that there are three resources, A, B, and C. There are 4 processes P0 to P3. At time T0, the current state of the system is as follows: (8)

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	1	0	1	2	1	1	2	1	1
P1	2	1	2	5	4	4			
P2	3	0	0	3	1	1			
P3	1	0	1	1	1	1			

Apply Banker's algorithm to check whether the system is in a safe state or not?

b) Describe the Readers–Writers Problem. Develop a solution for the Readers–Writers Problem using semaphores. Write the structure of the reader and writer processes. (6)

OR

16. a) Describe the Bounded - buffer problem and give a solution for the same using semaphores. Write the structure of producer and consumer processes. (8)

b) Why is deadlock state more critical than starvation? Draw the resource allocation graph (i) with deadlock (ii) with a cycle but no deadlock. (6)

MODULE IV

17. a) Consider a system that implements variable partition scheme. Given six memory holes of size 170 KB, 600 KB, 250 KB, 225 KB, 550 KB, and 425 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 80 KB, 200 KB, 53 KB, and 375 KB (in order)? (9)

b) When do page faults occur? Describe the actions taken by OS when a page fault occurs. (5)

OR

18. a) What is segmentation? How is it different from paging? Explain the address translation scheme in segmentation? (8)

b) Explain in detail simple and multilevel paging. (6)

MODULE V

19. a) Briefly explain the file allocation methods. (9)

b) With neat diagrams, explain the structure of directory and its implementation. (5)

OR

20. a) Suppose that a Disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 50. The queue of pending requests, in FIFO order, is 82,170,43,140,24,16,190. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all a pending requests, for each of the following disk scheduling algorithms? a. FCFS b. SSTF c. SCAN d. C-SCAN e. LOOK f. C-LOOK. (12)

b) List out and explain the various methods to access the information in a file. (2)

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