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Question Paper Code : 20869

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fourth Semester

Computer Science and Engineering

CS 3451 – INTRODUCTION TO OPERATING SYSTEMS

(Common to: Information Technology)

(Regulations 2021)

Time : Three hours                                      Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. "OS is a control program". Justify the statement with an example scenario.

2. Define system call. Give any two system calls with their purpose.

3. Draw the life cycle of a process.

4. Compare process creation and thread creation in terms of economy.

5. What is trashing?

6. List the advantages of demand paging.

7. Give the role of operating system in free space management.

8. List the various file access methods.

9. What are the benefits of virtual machines?

10. List any two components that are unique for mobile OS.

PART B — (5 × 13 = 65 marks)

11. (a) (i) List down the objectives and functions of Operating Systems.     (6)

    (ii) Detail the various types of user interfaces supported by Operating Systems.     (7)

Or

(b) (i) Explain various structures of Operating System. (6)

     (ii) Explain the purpose and importance of system calls in detail with examples. (7)

12. (a) Consider the following set of processes, with the length of the CPU burst time given in milliseconds.

| Process | Burst Time |
|---------|------------|
| P1 | 10 |
| P2 | 1 |
| P3 | 2 |
| P4 | 5 |

     (i) Draw Gantt's Chart illustrating the execution of these processes using FCFS, SJF and Round Robin (with quantum = 1) scheduling techniques. (6)

     (ii) Find the Turnaround time and waiting time of each process using the above technique. (7)

Or

(b) (i) What are semaphores? How do they implement mutual exclusion? (6)

     (ii) Explain the techniques used to prevent deadlocks. (7)

13. (a) Explain the need and concept of paging technique in memory management. (13)

Or

(b) Consider the page reference string: 1 2 3 4 1 3 0 1 2 4 1 and 3 page frames. Find the page faults, hit ratio and miss ratio using FIFO, optimal page replacement and LRU schemes. (13)

14. (a) Write detailed notes on file system interface and file system structure. (13)

Or

(b) Following are the references attempted to hard disks: 67,22,78,34,21,78,99. Recommend a suitable disk scheduling algorithm among FIFO, SSTF, SCAN and LOOK after applying all. Provide statements that support your recommendation.
(Note: Initial head position is at 20.) (13)

15. (a) Explain various types of virtual machines and their implementations in detail. (13)

Or

(b) (i) Explain the architecture of Android OS. (6)

(ii) Compare iOS with Android OS. (7)

PART C — (1 × 15 = 15 marks)

16. (a) Consider three processes, all arriving at time zero, with total execution time of 10, 20 and 30 units respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible.

(i) Calculate average waiting time and average turnaround time (5)

(ii) Draw Gantt chart of CPU burst (5)

(iii) Calculate CPU idle time (5)

Or

(b) Consider the following scenario. There are 4 segments in a program of sizes, A0=400B, A1=100B, A2=21B and A3=365B. Assume that the main memory address ranges from 0 to 1999, among which the following are the available free slots: 50-350, 450-500, 670-1060 and 1200-1850. Answer the followings:

(i) Provide diagrammatic representation of logical memory to physical memory (5)

(ii) Provide segment map table and draw a suitable memory management unit (5)

(iii) Find out internal, external and total fragmentation (3)

(iv) List the segments of following physical addresses: 1050, 560, 78, 2000. (2)

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