[Total No. of Questions - 9] [Total No. of Printed Pages - 3]

MAY-24-1049

MCA-6203 (Operating System)

MCA-2nd CBCS/NEP

Time : 3 Hours Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all, selecting one question each from Section A, B, C and D. Section E is compulsory.

Section A

1. a) List five services an operating system provides, and explain how each creates convenience for users. In which cases would it be impossible for user-level programs to provide these services? Explain your answer. (6)

   b) What is the fundamental difference between a process and a thread? Explain. (6)

2. a) What are the main functions of an operating system? Explain each one. (6)

   b) What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other? (6)

Section B

3. a) What is deadlock? Explain four conditions that must hold for there to be a deadlock. (6)

   b) Explain how the following scheduling algorithms discriminate either in favour or against short processes: i) FCFS ii) RR iii) Multilevel feedback queues (6)

4. a) The following processes are being scheduled using a preemptive, priority-based, round-robin scheduling algorithm.

Process	Priority	Burst	Arrival
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,

   i) Show the scheduling order of the processes using a Gantt chart.

   ii) What is the turnaround time for each process?

   iii) What is the waiting time for each process? (6)

   b) What is a critical action problem? Explain the three requirements that a solution to the critical-section problem must satisfy. (6)

Section C

5. a) What is paging? Explain the Hierarchical Paging technique with the help of neat and clean diagrams. (6)

   b) Discuss the strengths and weaknesses of implementing an access matrix using access lists that are associated with objects. (6)

[P.T.O.]

6. a) Explain Paging hardware with TLB with the help of a neat and clean diagram. (6)

   b) Explain the SSTF disk scheduling algorithm. Why is rotational latency usually not considered in disk scheduling? How would you modify SSTF to include latency optimization? (6)

Section D

7. a) Explain the implementation of the inter-process communication in Linux OS. (6)

   b) Write a note on the file system of the Windows operating system. (6)

8. a) Explain the design principles of Linux OS. (6)

   b) Discuss the process management in the Windows operating system. (6)

Section E (Compulsory)

9. a. Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs.

   b. Why do some systems store the operating system in firmware, while others store it on disk?

   c. What is a semaphore? What is a multi-value semaphore?

   d. Why interrupt and dispatch latency times must be bounded in a hard real-time system?

   e. List three examples of deadlocks that are not related to a computer system environment.

   f. Consider a logical address space of 256 pages with a 4-kB page size, mapped onto a physical memory of 64 frames. How many bits are required in the logical address? (6×2=12)