

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-V Semester (ECE)

COURSE CODE (CREDITS): 23B11EM511 (3)

MAX. MARKS: 35

COURSE NAME: OPERATING SYSTEMS

COURSE INSTRUCTORS: SLD, EMP

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems

Q1. Discuss the critical role of an operating system (OS) in computing, exploring its fundamental functions and highlighting the key types of operating systems. In your response, address how an OS manages hardware resources, facilitates user interaction, and enables the execution of applications. [CO1, 3M]

Q2. Examine the intricate concept of Interprocess Communication in computer systems, delving into its significance, mechanisms, and challenges. Explore the various methods employed for communication between processes. Additionally, analyze the impact of Interprocess Communication on system performance and resource utilization. [CO2, 4M]

Q3. Consider a set of processes with the following arrival times (in milliseconds) and burst times (in milliseconds)

Process id	Arrival Time	Burst time
P1	0	8
P2	2	4
P3	4	2
P4	6	5

Calculate the average waiting time and average turnaround time using the First-Come-First-Serve (FCFS) scheduling algorithm. Assume that the processes are scheduled in the order of their arrival. Show your step-by-step calculations and provide the final answers for both the average waiting time and average turnaround time. [CO3, 4M]

Q4. Define the Critical-Section Problem and its significance in ensuring safe and synchronized access to shared resources among multiple processes. Discuss the challenges associated with implementing a solution to the Critical-Section Problem, considering issues such as mutual exclusion, progress, and bounded waiting. Examine and compare different synchronization mechanisms and algorithms designed to address the Critical-Section Problem. [CO4, 4M]

- Q5. Describe the importance of efficient memory utilization and the role of the operating system in managing the computer's memory. Explore the key components of memory management, including the concepts of logical and physical addressing, memory allocation, and deallocation. [CO4, 4M]
- Q6. What is segmentation and explain how it differs from other memory allocation techniques. Discuss the motivation behind the development of segmentation and the scenarios in which it proves to be a more suitable approach than other methods. [CO4, 4M]
- Q7. What is a thread and how it differs from traditional processes. Discuss the motivation behind introducing threads in operating systems and how they contribute to improved concurrency and parallelism. [CO2, 4M]
- Q8. What is the concept of Mutex Locks in concurrent programming and how it addresses issues related to mutual exclusion in multithreaded or multiprocess environments. Discuss the critical role of Mutex Locks in ensuring that only one thread or process accesses a shared resource at a time. [CO4, 4M]
- Q9. Examine the concept of paging in operating system memory management, exploring its principles, advantages, and challenges. Discuss the motivation behind the development of paging and its role in addressing issues such as external fragmentation and varying memory requirements. [CO4, 4M]
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