

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2023

B. Tech. (CSE), Semester V, 2023-24

Roll No.....

CS1108: OPERATING SYSTEM

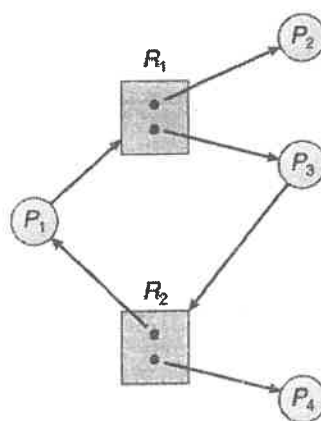
Time: 3 hours

Max. Marks: 40

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Mention all the assumptions for your answers clearly.

- Q. 1 (a) What are the four major activities of an operating system in regard to file management? 4.0 (CO1)
- (b) Discuss the difference between timesharing and multiprogramming operating system. 3.0 (CO2)
- Q. 2 (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. For what percentage of time does the CPU remain idle? 4.0 (CO3)
- (b) Consider the resource allocation graph given in the figure. 5.0 (CO4)



Find if the system is in a deadlock state. If the system is not in a deadlock state, find a safe sequence.

- Q.3 (a) A counting semaphore was initialized to 8. If 12P operations and 7V operations were completed on this semaphore, what is the resulting value of semaphore? 3.0 (CO4)
- (b) Illustrate how a binary semaphore can be used to implement mutual exclusion among n processes. 3.0 (CO4)
- (c) Consider a main memory with five page frames and the following sequence of page references: 3, 8, 2, 3, 9, 1, 6, 3, 8, 9, 3, 6, 2, 1, 3. How many page faults occurs in case of First In First Out (FIFO), Least Recently Used (LRU), and Optimal Page Replacement (OPR) policy? Show in detail. 5.0 (CO4)
- Q.4 (a) Consider a paging hardware with a Translation Lookaside Buffer (TLB). Assume that the entire page table and all the pages are in the physical memory. It takes 10 milliseconds to search the TLB and 80 milliseconds to access the physical memory. What is the effective memory access time (in milliseconds), if the TLB hit ratio is 0.6? 4.0 (CO4)
- (b) A machine supports a 48 bit virtual address and 32 bit physical address. Pages are 8KB. If the page table entry contains besides other information, one V/I bit, 1R, 1M and 2 bits for page protection. What is the page table size in bytes? 4.0 (CO4)
- Q.5 The index node (inode) of a Unix-like file system has 12 direct, one single-indirect and one double-indirect pointers. The disk block size is 4 kB, and the disk block address is 32-bits long. What is the maximum possible file size in gigabytes? 5.0 (CO4,5)

OR

- Q.5 Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests in order is: 5.0 (CO5)

86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests using the following scheduling algorithms?

(a) SCAN

(b) LOOK