

Y/K/TX

Reg. No:



VIT[®]

Vellore Institute of Technology

Final Assessment Test - November 2024

Course: BITE303L - Operating Systems

Class NBR(s): 3311 / 3324 / 3342

Time: Three Hours

Slot: A1+TA1

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

- *1. It is sometimes difficult to achieve a layered approach, if two operating system components depend on each other. Identify a scenario in which it is unclear, how to layer two system components that require tight coupling of their functionalities. Elucidate the operating system structures.
- 2. Assume that you have been working on a multiprocessor system and written multithreaded coding through a many-to-many threading model. Consider that the total number of kernel-level threads needed for the program is less than the user-level threads.
Enumerate the performance inferences w.r.t given scenarios.
 - a) The number of processors is greater than the total no. of kernel-level threads assigned to the code.
 - b) The number of processors is equal to the total no. of kernel-level threads assigned to the code.
 - c) The number of processors is less than the total no. of kernel-level threads which is less than the no. of user-level threads assigned to the code.
- 3. Consider the given set of processes, with the length of the CPU-burst time in milliseconds, and determine the following:

Process	Burst	Time Arrival	Time Priority
A	8 7 6 5 2 1	0 3 2 1	3
B	2 1	2	1
C	3 2 1	2	2
D	4 3 2 1	8	4
E	6 5 4 3 2 1	9	5

Draw Gantt charts to illustrate the execution of these processes using SJF and pre-emptive Priority, and RR (quantum =1) scheduling. What is the average turnaround time and average waiting time for each of the scheduling algorithms? Which algorithm gives optimum waiting time and turnaround time?

4. Consider the given snapshot of a system and determine the following using Banker's algorithm:

How many resources of type W, X, Y, and Z are there? What are the contents of a need matrix? Find out if the system is in a safe state. If it is, find the safe sequence. If a request from process P1 arrives for (2, 0, 1, 0), can the request be granted immediately? If yes, show the possible order of execution (Safe Sequence).

Process	Max	Allocation	Available
	W, X, Y, Z	W, X, Y, Z	W, X, Y, Z
P0	7 3 4 3	5 1 2 2	5 3 3 2
P1	8 6 6 3	4 3 1 1	
P2	6 3 5 6	3 2 4 3	
P3	4 6 3 4	1 4 2 3	
P4	4 4 5 4	2 4 2 1	

5. Consider our www.vit.ac.in web portal which can be used by N number of users (students, faculties, parents) and M number of administrators. The N number of users can simultaneously access the website at a time whereas out of M administrators, only one administrator can update the website. Demonstrate the above scenario with appropriate code using semaphores.
6. Consider the following page reference string, 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. Find out the number of page faults, hit ratio, and miss ratio if there are 4-page frames, for the FIFO, Optimal, and LRU page replacement algorithms. And identify which algorithm generates high page faults.
7. Given a set of processes and free holes as in the below table, apply first fit, best fit and worst fit algorithms to allocate processes into holes. Calculate the total amount of externally fragmented memory in each allocation scheme. What happens if we partition the holes into equal sizes and allocate the required number of holes to processes? Does it cause external fragmentation? Briefly discuss the role of compaction in the below scenario.

ID	P1	P2	P3	P4	P5	P6
Size	70	40	85	50	75	125
Hole	1	2	3	4	5	6
Size	90	65	80	70	45	140

8. Suppose that a disk drive has 8000 cylinders, numbered 0 to 7999. The drive is currently serving a request at cylinder 113, and the previous request was at cylinder 105. The queue of pending requests, in FIFO order, is
70, 1350, 610, 1760, 1020, 1490, 1010, 1740, 110

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for SCAN, C-SCAN, and LOOK disk-scheduling algorithms?

9.a) Consider the dining philosopher's problem. If we place all five chopsticks in the center of the table, how could you use monitors to implement the philosophers eat () method? Be sure to declare and initialize all variables you use. Your solution should be as efficient as possible. You should define two methods begin () and end ().

OR

9.b) A shared variable COUNT initially containing the value 6. Two processes named PROD and CONS (both sharing the variable CNT) perform a COUNT++ and COUNT-- concurrently to keep track of the number of items available in the buffer. Identify the possible outcome of these operations. Justify the need for synchronization in this context. Provide a solution (Pseudocode or Program) for synchronization between these two processes using semaphores.

10.a) You have been appointed as an administrator of the VIT file management system. How will you organize your set of files and directories using various directory schemes? Illustrate with proper explanation.

OR

10.b) You have been appointed as an administrator of the VIT file management system. How will you access your set of files? Illustrate with proper explanation.

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