VIT
Vellore Institute of Technology
CHENNAI

Reg. Number:	21BLC1122

Continuous Assessment Test(CAT) – II - April 2024

Programme	:	B.Tech. (Computer Science and Engineering)	Semester	:	Winter 2023-24
Course Code & Course Title	:	BCSE303L : Operating Systems	Class Number	:	CH2023240501868 CH2023240501870 CH2023240502688 CH2023240502689 CH2023240502690 CH2023240501872 CH2023240502691(BCSE303L)/ CH2023240502853(CSE2005)
Faculty	:	PRADEEP K V, BHANU CHANDER BALUSA, PRADEEP K, KIRUTHIKA S, ANANDAN P, SUDHARSON S, VALLIDEVI K	Slot	:	D2+TD2
Duration	:	90 Minutes	Max. Mark		50

General Instructions:
Write only your registration number on the question paper in the box provided and do not write other information.

- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks
1		Imagine a beverage firm that has four different types of printers (A, B, C, D) and five departments: marketing, production, R&D, finance, and HR. The company currently has the following resources available: A(3), B(6), C(5), and D(6). Resource allocation for each department, including the following: R&D: A (1), B(3), C(5), and D(4); Finance: A(0), B(6), C(3), and D(2); Marketing: A(0), B(0), C(1), and D(0); Production: A (1), B(0), C(0), and D(0); and HR: A(0), B(0), C(1), and D(4). The marketing department (A,B,C,D) - (1, 5, 2, 0); the production department (A,B,C,D) - (1, 7, 5, 0); the research and development department (A,B,C,D) - (2, 3, 5, 6); the finance department (A,B,C,D) - (0, 6, 5, 2); and the human resources department (A,B,C,D) - (0, 6, 5, 6). This is the maximum expected resource from the different departments. As an Operating System Designer answer the following: • Discuss the necessary and sufficient conditions for a deadlock to happen in the system or not. (2 Marks) • Determine the need of each department for various resources (2 Marks) • Ensure the system is in safe or unsafe state with the available resources using appropriate algorithm? (3 Marks) • If a request (0, 4, 2, 0) from the Production department	10

		arrives, can the request be granted immediately or not with proper justification (3 Marks)	
2		Chess is a two-player game played on a standard chessboard. If one person is playing, the other player has to wait for his turn, and vice versa. As a chess player, write an appropriate pseudo code to solve the given problem using a suitable synchronization technique by justifying all the conditions that satisfy the critical section problem. (Hint : Player1 (say 'p') and Player2(say 'q'). Use 'p' and 'q' notation in the pseudocode)	10
3		Redesign the readers-writers dilemma so that a reader begins reading after two writers have finished their writing. The third writer must wait until five readers have finished their reading. Provide the optimized and efficient synchronization solution that uses relevant variables and functions if necessary with the pseudo-code for the aforementioned scenario.	10
4		An ice cream business has ten ice cream freezers with variable amounts of storage space for different flavors of ice cream. The storage capacities of these freezers are as follows (in order): 220 liters, 50 liters, 200 liters, 300 liters, 600 liters, 400 liters, 250 liters, 450 liters, 350 liters, and 700 liters. Assume that 10 different types of ice cream are being created, each requiring a certain quantity of storage space. The storage requirements for these flavors (in order) are as follows: 212, 417, 112, 426, 350, 500, 275, 400, 600, and 50 liters. Using various allocation algorithms, allocate freezers to different ice cream flavors for storage. Calculate the internal and external fragmentation for each strategy.	10
5		a) Consider a page reference string 8,1,2,3,1,4,1,5,3,4,1,4,3,2,3,1,2,8,1,2: Consider a system running on a computer such that the main memory has 3 page frames. Which replacement algorithm among FIFO and OPTIMAL has a minimum number of page fault and also find the page fault probability in both the algorithms. (8 Marks) b) For the above question (a) Comment on the efficiency of the two algorithms for the given frame size. (2 Marks)	10

**********All the best **********