Reg. No.:

Name :

VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test II – June 2023

Programme	:	B.Tech. CSE.	Semester	:	Fall Inter 2022-23
Course Code/Title	:	BCSE303L -Operating System	Slot	:	E2+TE2
Faculty	:	Dr. Abdul Quadir MD Dr. Bhanu Chander Balusa Dr. Rishikeshan C A Dr. Sandeep Kumar Satapathy Dr. Pradeep K Dr. Valarmathi P Dr. Indra Priyadharshini Dr. Monica Dr. Sangeetha N Dr. Anandan P Dr. Yogesh C Dr. Leki Chom Thungon Dr. Tapabrata Roy	Class Number	:	CH2022232500759 CH2022232500982 CH2022232500983 CH2022232500993 CH2022232500992 CH2022232500988 CH2022232500755 CH2022232500756 CH2022232500757 CH2022232500758 CH2022232500760 CH2022232501076 CH2022232501075
Time	:	1½ Hours	Max. Marks	:	50

Answer ALL Questions

1. In a bakery, there are multiple baking stations where different tasks are performed to create various bakery goods. Assume that bakery has five baking stations. Each baking station requires specific resources such as oven, mixers and pans to carry out the tasks effectively. At time T_0, allocation and maximum requirement of resources for all the baking station are shown in the table below. **10**

BAKING STATIONS	ALLOCATION			MAXIMUM		
	OVEN	MIXER	PAN	OVEN	MIXER	PAN
A	0	1	0	7	5	3
B	2	0	0	3	2	2
C	3	0	2	9	0	2
D	2	1	1	2	2	2
E	0	0	2	4	3	3

Current available resources are 3,3,2.

i. Check whether baking stations can finish their tasks. If so, specify the order in which each baking station completes the task.

ii. If additional request from baking station 'A' raised for (3,3,0) resources, can the request be granted immediately? If yes, specify the order in which each baking station completes the task, if no, justify.

2. In cooking competition event conducted in Vibrance, the organizing committee has the following components: five frying pans, five cooking pots, five induction stoves, and five wooden spoons. There are four teams participating with the following **10**

	scenario: • TEAM 1 having two induction stoves but waiting for four frying pans to prepare their food. • TEAM 2 having three induction stoves, one wooden spoon, one cooking pot and two frying pans but waiting for one frying pan and one wooden spoon to prepare their food. • TEAM 3 having two cooking pot and one wooden spoon but waiting for two induction stoves and one wooden spoon to prepare their food. • TEAM 4 having one cooking pot and two frying pans but waiting for four induction stoves to prepare their food. . Draw the resource allocation graph for the given problem. Perform the deadlock detection algorithm and verify if deadlock exist or not. If no deadlock exists then find the safe sequence. If there is a deadlock, suggest a technique to overcome.	
3.	A team of students are doing a project, where they store their results of implementation in a common drive shared drive. At a time only one student is allowed to access the drive for modification in order to avoid inconsistency of data stored. Explain how synchronization can be achieved among the students by implementing hardware instruction and also prove that the solution satisfies all the requirements of critical section.	**10**

4.	Consider group of kids are picking cake cubes from a container that can hold up to N cakes. A child who wants to eat a cake picks one from the Container to eat. If a kid finds the Container to be vacant, the kid updates to his mother and waits until the mother refills the container with N cakes. Unsynchronized code snippets for the kid and mother threads are shown below:
	`//Kid`
	`while True:`
	`getCakeFromContainer()`
	`eat()`
	`//Mother`
	`while True:`
	`refillCakeContainer(N)`
	The following variables have been declared for use in your solution.
	`int count = 0;`
	`mutex m; // invoke lock and unlock`
	You may perform wait and signal or signal_broadcast with the following:
	`condvar fullContainer, vacantContainer`
	Your task is to provide modified code of the mother and kid threads by adding suitable synchronization such that a kid invokes getCakeFromContainer () only if the Container is non-empty, and the mother invokes refillCakeContainer(N) only if the Container is fully vacant. Solve this question using only locks and condition variables, and no other synchronization primitive.
		10

5.	You are a software developer working on a memory-intensive application that manipulates large amounts of data. The application frequently needs to allocate and de-allocate memory dynamically. The current memory allocation strategy is causing performance issues, hence you have been given a task to improve. Given five memory partitions of 130KB, 540KB, 220KB, 335KB, 585KB (in order), show how would the various memory allocation algorithms allocate processes of 190 KB, 390 KB, 121 KB, and 450 KB (in order)? Which algorithm makes the most efficient use of memory? Justify your answer.	**10**