VIT

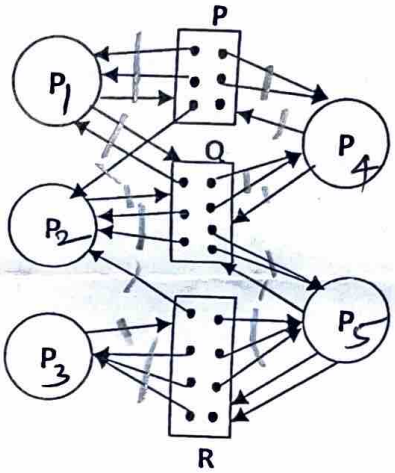
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science and Engineering
Fall Semester 2023-24 UG Seniors (B.Tech 2021 Batch)
Continuous Assessment Test – 2

SLOT: B1 + TB1, B2 + TB2

Programme Name & Branch: B.Tech & BCB, BCE, BCI, BCT, BDS, BKT
Course Name & code: Operating Systems & BCSE303L
Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): Answer all the questions

Q.No.	Question	Max Marks
1.	Consider the system with 5 processes (P1, P2, P3, P4 and P5) and three resource types (P, Q and R). The following resource allocation graph represents the current allocation and the requests of each process. i) Check whether the current system is in safe state or not? If safe, print the safe sequence. If unsafe, what is the minimum number of resource instance is needed to be available for this system to be safe. (7 Marks) ii) With reference to the above safe system, suppose process P1 requests one additional instance from R, check whether it can be granted immediately or not? If yes, print the order in which the process are completing their execution. (3 Marks) 	10
2.	Write the pseudo code of Peterson's method and analyze with justification each of the output for the below given scenarios. The above table shows the interest of process P0 and P1 to enter the critical section ("True" denotes interested, "False" denotes not interested) and "Turn" denotes which process is currently under execution. Assume initially both processes are not interested to get into the critical section. (7 marks) Also justify whether mutual exclusion and progress is guaranteed for Peterson's method with an example for each. (3 Marks)	10
3.	a) Consider a speaker presenting a technical session and a maximum of 50 participants are allowed to attend the presentation. If the participant wants to interact with the speaker during the presentation, he/she must get the permission from the speaker. If the speaker agrees to interact, speaker stops his presentation and opens the session for discussion. Once the speaker closes the discussion session and resumes his presentation, the participants are not allowed to interact. The participants are	10

S.No	Interested[P0]	Interested [P1]	Turn
1	True	False	P0
2	True	True	P0
3	True	True	P1
4	False	True	P1

allowed to enter or exit the hall only during the discussion time. Discuss the need of process synchronization and develop the solution (pseudo code) to this problem. (6 Marks)

b) Apply binary semaphores to the following scenario given below. Consider two processes P_0 and P_1 are executed in sequence. Trace the algorithm and write the possible sequence of output. (4 Marks)

```
mutex a,b;
a=1, b=0;
        P0                      P1
while (true) {          while (true) {
    down (a);               down (b);
    print ("3");           print ("2");
    up (b); }               up (a); }
```

4. a) Consider there are 4 partitions of size 4MB, 8 MB, 20 MB and 2 MB respectively. Assume that the partitions are released for the next job to occupy once the previous jobs have run to completion. The list of jobs and their appropriate time for execution is given below, 10

Job ID	J1	J2	J3	J4	J5	J6	J7
Job size (in MB)	2	14	3	6	2	10	20
Time for execution	4	10	2	1	6	1	8
Completion time	?	?	?	?	?	?	?

Identify at what time each of the jobs will get over if "Best-fit" algorithm is applied to the above scenario with the help of a chart. Also identify whether there arises a situation of external fragmentation at any time of execution. (4 Marks)

b) Consider a system which is Byte addressable which contains total main memory as 64 Bytes. Assume that the first 4 frames of the main memory are already occupied by a system level process. Now a new process has arrived with size 32 Bytes which has to be accommodated into the main memory using paging technique. Assume the frame size = page size = 4 Bytes. Identify the location (with frame number and frame offset) where the 12^{th} Byte of the process is stored in the main memory. Depict the above scenario with a detailed view of how the bytes are stored in the main memory, process table and page table. (6 Marks)

5. a)Suppose we have a page trace {4, 3, 2,1,4,3,5,4,3,2,1,5}. Use FIFO and LRU to run this page trace with 3 page frames and then with 4 page frames. For each replacement algorithm, clearly show the page replacement activities, number of page faults, hit ratio, and miss ratio. Also, indicate Belady anomaly if there is any for each of the replacement algorithms given. (7 Marks) 10

b) A paging scheme uses Translation Lookaside Buffer (TLB). Suppose time taken to search a page entry in the TLB is 20 ns, time taken to access a byte/word from a main memory is 100 ns, and an effective memory access time is 160 ns. Assume, no page fault has occurred and two level page table is used .Determine the percentage of times that the page number of interest is found and not found in the TLB respectively. (3 Marks)