

: CSE

: 9th March 2023/ 3:30 -4:30 PM

: CSPC43

DURATION:1 hour

Answer all the questions

1. What is dual-mode operation? (1)
2. Briefly discuss the different types of parallelism. (1)
3. For the following set of processes, find the average waiting time, and turnaround time while applying the RR algorithm. Assume that the quantum time is 10 ms. Draw charts and show the calculations. (4)

Process Number	Burst (ms)	Arrival (ms)
P1	25 15	0
P2	10 2	10
P3	20 10	15
P4	10	25
P5	60 30	20

- Write a Pthread program which takes a number n as command line argument and calls a function called 'calculator' that counts and prints the count of even numbers from 0 to the given n . (3)
- Consider the following snapshot of a system in which four resources A, B, C and D are available. The system contains a total of 6 instances of A, 4 of resource B, 4 of resource C and 2 of resource D (suppose at a time t_0 request 1200 checks if it can be immediately).

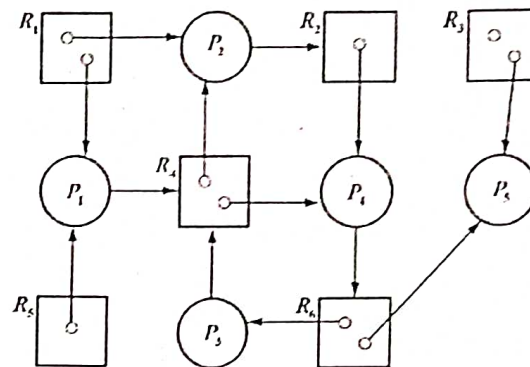
	Allocation				Max				Need				Available			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
P_0	2	0	1	1	3	2	<u>1</u>	1					6	4	4	2
P_1	1	1	0	0	1	2	0	2								
P_2	1	0	1	0	3	2	1	0								
P_3	0	1	0	1	2	1	0	1								

6. Consider the following resource allocation graph. Is there a deadlock? If so, what are the processes involved. (2)

(2)



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7. Consider the Dekker's algorithm below. The two processes, P_0 and P_1 , share the following variables: (3)

```
boolean flag[2]; /* initially false */
int turn;
```

The structure of process P_i ($i == 0$ or 1) is shown below. The other process is P_j ($j == 1$ or 0). Prove that the algorithm satisfies all three requirements for the critical-section problem.

```
do {
    flag[i] = true;

    while (flag[j]) {
        if (turn == j) {
            flag[i] = false;
            while (turn == j)
                ; /* do nothing */
            flag[i] = true;
        }
    }

    /* critical section */

    turn = j;
    flag[i] = false;

    /* remainder section */
} while (true);
```

8. For the monitor program that we discussed in class, illustrate a situation in which a philosopher might be starved to death. (2)