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Assigment 3

PART A

1. Race condition

→ A Race condition happens when two or more Process try to change shared data it the same time and the result depends on the order of execution

Example: Image two people withdrawing ₹ 500 from the same bank accsent with ₹ 1000 balance at the same time. Both check the balance before withdrawl and cut ~~₹ 1000~~ Each check the balance before withdrawl and sell ₹ 1000. Each withdraw ₹ 500, leading to ₹ 500 leading to ₹ 500 extra being withdrawn

2 Peterson's solution vs semalphore

Aspect	Peterson solution	Semaphore
Implementation	Software based	OS support mechan
complexity +	Simple logic, limited scalability	work for multiple process, more comp
Hardward dependency	Non	Practical with wi used in OS

3 Monitors in produce consumer problem

→ Advantage in multi case system
monitors provide automatic mutual expension - only one process execute inside the monitor at a time

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In multicore system, the simplifies sychonization and reduce busy waiting compared to Semalphones, emproving program and reliability

4 Hold and wait condition

Drawo of eliminating hold and wait:-
Process must request all required resource at once. This leads to:-

- Poor resource utilization
- Reduced concurrency, since may process wait even thought they could encale with partial resource.

Part B

6 Banker's Algorithm

-> Given:-

Total = (10, 5, 7)

Process	Allocation (A, B, C)
P0	0, 1, 0
P_1	2, 0, 0
P_2	3, 0, 2
P3	2, 1, 1
P4	0, 0, 2

(a) Need = max - allocation

Process	Need (A, B, C)
P0	7, 4, 3
P_1	1, 2, 2
P2	6, 0, 0
P3	2, 1, 1
P4	5, 3, 1

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Available = Total - Allocation sum
Allocation sum = (7,2,6) - Available =
(3,3,1)

(b) safe state check :-
work = (3,3,1)
P_1 can run (Need ≤ work → New = (5,3,1)
P_3 can run → work = (7,4,2)
P_4 can run → work = (7,4,4)
P_0 can run → work = (7,5,4)
P_2 can run → work = (10,5,6)

safe sequence = $P_1 \to P_3 \to P_4 \to P_0 \to P_2$
System is in safe

(c) If P_1 request (1,0,2)
New need = (0,2,0) Request ≤ Available
(1,0,2) ≤ (3,3,1) → × C = 3 > 1
cannot be granted immediately.

7 Dinning philosphers

→ Deadlock scenario →
Each philosphers picks up there left chopstick first, all hold on chopstick, and none can pick the right one → deadlock.
Solution : use semaphore array
chopstick [5] = 1 and a matrix for limit
wait (matrix);
wait (chopstick [i]);
wait (chopstick [(i+1) % 5]);
eat ( );

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signal (chopstick[i]);
signal (chopstick [(i+1)%5]);
Signal (motex);

8. I/O system Analysis:-
Given:

Interrupt time = 5ms
Transfer rate = 500KB/s = 512000 bytes
Block = 100 bytes

a Interrupts per second = 512000/100 = 5120
CPU Time = 5120 × 5 ms
= 25.6ms per seconds

(b) Improvement: use direct money accur (DMA) to transfer data directly without frequent CU interrupt

9 Air Traffic control system
→ (a) critical section:-
- updating shared radar data
- flight path computer database
- communication logs

IPC mechanism
Use message quees or real time semaphore for synchorohization ensuring quick switching and real time safety

b Deadlock detection & recovery:-
- use resource allocation graph for detection
- on detection, preenpt non-critical process and restart with priority schedulin

to maintain system continuity

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