Branch : CSE & IT Batch : Hinglish

Operating Systems

Deadlock

DPP 01

[MSQ]

1. Which of the following is not a hardware resource?

(a) Semaphore (b) Files

(c) Register (d) CPU

[MCQ]

2. If a process request is denied by OS and it is blocked forever, then the process is in _____.

(a) Starvation (b) Deadlock

(c) Ageing (d) Blocking

[MSQ]

3. What are the necessary conditions for deadlock?

(a) Mutual exclusion

(b) Hold and wait

(c) Circular wait

(d) Pre-emption

[MCQ]

4. Consider the following statements:

(i) Cycle in single instance resource is sufficient and necessary condition for deadlock.

(ii) Cycle in multi-instance resource is necessary and sufficient condition for deadlock.

Which of the following is correct?

(a) Only (i) is correct

(b) Only (ii) is correct

(c) Both (i) and (ii) are correct

(d) Both (i) and (ii) are incorrect

[MSQ]

5. In which deadlock handling strategy, deadlock can never occur?

(a) Deadlock avoidance

(b) Deadlock recovery

(c) Deadlock removal

(d) Deadlock prevention

[NAT]

6. Consider a system having 'n' resources. All these resources are shared between four processes P_0, P_1, P_2, P_3 and each process has a demand of 6, 9, 7 and 14 respectively.

What should be the maximum value of 'n' in order to lead the system to deadlock?

[MSQ]

7. Consider the following system state:

Process	Allocated	Maximum allocation
P_1	2	7
P_2	3	8
P_3	4	6

There are total 11 resources available, which of the following sequences will lead system to safe state.

(a) $P_1\ P_2\ P_3$

(b) $P_1\ P_3\ P_2$

(c) $P_3\ P_2\ P_1$

(d) $P_3\ P_1\ P_2$

[NAT]

8. Consider a system with five processes A, B, C, D and E. The requirements of resources to complete execution by A, B, C, D and E are 7, 6, 8, 12 and 11 respectively. Then, what is the minimum number of resources required to avoid deadlock in such a system?

[NAT]

9. If a system has 8 processes, each process needs maximum of 4 instances of a resources 'R', what is the maximum value of resources, so that the system is in deadlock?

Answer Key

1. **(a, b)**
2. **(b)**
3. **(a, b, c)**
4. **(a)**
5. **(a, d)**
6. **(32)**
7. **(c, d)**
8. **(40)**
9. **(24)**

Hints & Solutions

1. (a, b)

Semaphore and files are not hardware resource. Whereas, register and CPU are hardware resource.

2. (b)

If a process request is denied and the process is blocked forever, then the process is in deadlock.

3. (a, b, c)

There are four necessary conditions for deadlock:

(a) Mutual exclusion

(b) Hold and wait

(c) No-preemption

(d) Circular wait

4. (a)

Cycle in single instance resources is sufficient and necessary condition.

But cycle in multi-instance resource is necessary not sufficient condition to cause deadlock.

5. (a, d)

In deadlock prevention and deadlock avoidance strategies of deadlock handling, deadlock can never occur.

6. (32)

We know,

To avoid the deadlock the minimum resources required is:

$$\text{Number of resources} \geq \sum_{i=0}^{n} (\max - \text{need}(i) - 1) + 1$$

In order to lead to deadlock, we need to remove an resource provided to each process. So,

P_0 will have 5 resources

P_1 will have 8 resources

P_2 will have 6 resources

P_3 will have 13 resources

If any one process gets atleast one more resource then it can complete and then other process can also complete their execution subsequently.

Therefore, the maximum value of n will be:

5 + 8 + 6 + 13

n = 32

7. (c, d)

Process	Allocated	Maximum allocation	Need
P_1	2	7	5
P_2	3	8	5
P_3	4	6	2

Available = 11 – (2 + 3 + 4)

= 11 – 9

= 2

Process P_3 needs 2 resources, so remaining resources will be allocated to P_3.

Now available = 2 + 4 = 6

Any of the P_1 and P_2 can satisfy their need.

P_3 P_2 P_1 and P_3 P_1 P_2 both are safe sequences.

8. (40)

A requires 7 resources to complete its execution.

B requires 6 resources to complete its execution.

C requires 8 resources to complete its execution.

D requires 12 resources to complete its execution.

E requires 11 resources to complete its execution.

Then to avoid deadlock resources will be assigned as:

$A \rightarrow 6$

$B \rightarrow 5$

$C \rightarrow 7$

$D \rightarrow 11$

$E \rightarrow 10$

$+ 1$

40

9. (24)

Total 8 process and each process requires maximum of 4 instances of resources ‘R’.

So,

$R \leq (4 - 1) \times 8$

$R \leq 3 \times 8$

$R \leq 24$

Maximum value of R is 24, if R is 25 then there is no deadlock. So, 24 is the maximum value of resources that can cause deadlock.