1) Consider a system which has R identical resources, 5 processes competing for them and 3 is the maximum need of each process. Then the minimum number of resources required such that deadlock will never occur is _____. **[NAT]**

2) Consider a system that has four processes and five resources. The current allocation and maximum needs are shown below:

| Process | Allocated | | | | | Maximum | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| P1 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 3 |
| P2 | 2 | 0 | 1 | 1 | 0 | 2 | 2 | 2 | 1 | 0 |
| P3 | 1 | 1 | 0 | 1 | 1 | 2 | 1 | 3 | 1 | 1 |
| P4 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 2 | 0 |

If Available = [ 0 0 X 1 1 ], what is the minimum value of **x** for which this is a safe state?
A) 1
B) 2
C) 3
D) 4

3) Given a request from process *P* for resource *R*, a deadlock prevention algorithm is given below, where the resources have unique priorities:

**Algorithm**

```
if process P currently has any resources with equal or higher priority
than resources R, then
        refuse the request
else if resource R1 does not exist, then
        refuse the request
else
{
        if the resource R is not free, then
            wait until resource R is free
        end if
        grant process P exclusive access to resources R
}
```

In the above algorithm for preventing deadlock, each resource type is assigned a unique integer as a priority, with 2 as lowest priority and 0 as highest priority. Suppose

- resource R1 has priority 2,
- resource R2 has priority 1,
- resource R3 has priority 0.

Given this sequence of requests and frees:

- P1 requests R1,
- P3 requests R3,
- P1 requests R2,
- P1 frees R2,
- P2 requests R2,
- P2 frees R2,
- P3 requests R2,
- P3 frees R2

Which of the following are correct? **[MSQ]**
A) P1 requests R1: P1 is granted R1
B) P3 requests R3 ==> P3 is denied R3
C) P1 requests R2 ==> P1 is granted R2 because its priority is higher than R1
D) P3 frees R2 ==> no change because its was never granted

4) Consider a system with four processes P1, P2, P3, and P4, and two resources, R1, and R2, respectively.
Each resource has two instances.
-P1 allocates an instance of R2, and requests an instance of R1;
-P2 allocates an instance of R1, and doesn't need any other resource;
-P3 allocates an instance of R1 and requires an instance of R2;
-P4 allocates an instance of R2, and doesn't need any other resource.

Which one of the following is correct ?

A) No cycle is present in the corresponding Resource Allocation Graph (RAG).
B) Cycle is present but no deadlock.
C) Cycle is present and leads to deadlock.
D) None of these.

5) Which of the following are TRUE regarding Wait-for Graphs? **[MSQ]**

A) In a single instance resource system, cycles in the wait-for graph indicate deadlocks.
B) A wait-for graph is used for deadlock detection.
C) A wait-for graph can be constructed from a resource-allocation graph.
D) In a single instance resource system, cycles in the wait-for graph may not indicate deadlocks.

6) An operating system contains 3 user processes each requiring 2 units of resource R. The minimum number of units of R such that no deadlock will ever occur is_____
A) 1
B) 2
C) 3
D) 4

7) Which one of the following is not true?
(A) Safe state means there is no deadlock.
(B) Unsafe state always leads to a deadlock.
(C) There are four necessary conditions for a deadlock.
(D) All resources are not pre-emptable.

8) Which one of the following is not a deadlock recovery method?
(A) Resource pre-emption
(B) Rollback
(C) Abort the process
(D) Hold and wait

9) Consider the following system snapshot of four processes with 2 resources ?

Current allocation matrix

| | R1 | R2 |
|---|---|---|
| P1 | 1 | 3 |
| P2 | 4 | 1 |
| P3 | 1 | 2 |
| P4 | 2 | 0 |

Current request matrix

| | R1 | R2 |
|---|---|---|
| P1 | 1 | 2 |
| P2 | 4 | 3 |
| P3 | 1 | 7 |
| P4 | 5 | 1 |

What should be the Availability Vector such that the deadlock will not occur :

A) 1, 4
B) 2, 3
C) 2, 4
D) None of these.

10) Consider **p** processes each needing a maximum of **m** resources and a total of **r** resources available. What condition must hold to make the system deadlock free?

A) $r >= p(m - 1) + 1$
B) $r >= p(m - 1)$
C) $r <= p(m - 1) + 1$
D) $r < p(m - 1) + 1$

11) A computer system has 6 tape drives, with 'n' processes competing for them. Each process may need 3 tape drives. The value of 'n' for which the system is guaranteed to be deadlock free is? **[MSQ]**
a) 2
b) 3
c) 4
d) 1

12) If 'm' processes share 'n' resources of the same type, the maximum need of each process does not exceed 'n' and the sum of all their maximum needs is always less than 'm+n'. In this case:
(a) Deadlock can never occur
(b) Deadlock may occur
(c) Deadlock has to occur
(d) None

13) A system is having 10 user processes each requiring 3 units of resource R. The minimum number of units of R such that no deadlock will occur _____?

| |
|---|
| 13) A system is having 3 user processes P1, P2 and P3 where P1 requires 2 units of resource R, P2 requires 3 units of resource R, P3 requires 4 units of resource R. The minimum number of units of R that ensures no deadlock is _____? |
| 14) A system is having 3 user processes P1, P2 and P3 where P1 requires 21 units of resource R, P2 requires 31 units of resource R, P3 requires 41 units of resource R. The minimum number of units of R that ensures no deadlock is _____? |
| 15) If there are 6 units of resource R in the system and each process in the system requires 3 units of resource R, then how many processes can be present at maximum so that no deadlock will occur? |
| 16) Consider a system having m resources of the same type being shared by n processes. Resources can be requested and released by processes only one at a time. The system is deadlock free if and only if-<br><br>The sum of all max needs is < m+n<br>The sum of all max needs is > m+n<br>Both of above<br>None of these |