Set Number - 3

1. What is a semaphore, and how is it used for process synchronization?

2. Consider a system with 4 processes (P1-P4) and 3 resource types (A, B, C). The available resources are A = 10, B = 5, C = 7. Given the maximum need and allocated resources, determine whether a deadlock exists using the Banker's Algorithm, and explain the result, including the use of resource allocation graphs?

3. Describe a real-world example of a deadlock in a web application, and suggest possible solutions to avoid it, including the use of locking mechanisms and transaction management?

4. Describe the role of a process control block (PCB) in process management?

5. Explain the concept of a real-time system, and provide an example of its implementation, including the benefits of using real-time systems for critical applications?

6. What is a context switch, and how does it affect system performance?

7. How does the Banker?s Algorithm prevent deadlock? Differentiate between safe state and unsafe state in deadlock avoidance. Section B: Medium Answer Questions (3 marks each) Explain Wait-For Graph and how it is used for deadlock detection. Describe the four Coffman conditions necessary for a deadlock to occur.

8. What is a virtual private network (VPN), and how does it ensure secure communication?

9. What is a router, and how does it forward packets in a network?

10. What is a critical section, and how is it used to prevent data inconsistency?

11. Describe the difference between a spinlock and a semaphore, and explain their use cases?

12. What is a virtual machine, and how does it provide platform independence, including the use of virtual machine monitors and emulators?

13. Explain the concept of a load balancer, and provide an example of its implementation, including the benefits of using load balancers for distributed systems?

14. Describe a real-world example of a deadlock in a file system, and suggest possible solutions to avoid it, including the use of locking mechanisms and file system protocols?

15. Describe the concept of virtual memory, and explain its benefits?

16. Explain the concept of subnetting, and provide an example of its use?

17. Describe a real-world example of a deadlock in a database system, and suggest possible solutions to avoid it, including the use of locking mechanisms and transaction management?

18. Describe the role of a firewall in network security, and explain its configuration?