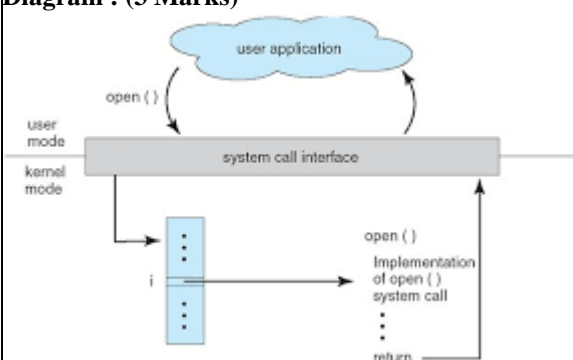


b	<p>What are virtual machines? How are they implemented?</p> <p>The fundamental idea behind a virtual machine is to abstract the hardware of a single computer(the CPU, memory, disk drives, network interface cards, and so forth) into several differentexecution environments (2 Marks)</p> <p>Diagram (2 Marks)</p> <p>Implementation(2Marks)</p> <ul style="list-style-type: none"> • The virtual-machine concept is useful, it is difficult to implement. • Work is required to provide an exact duplicate of the underlying machine. Remember that the underlying machine has two modes: user mode and kernel mode. • The virtual-machine software can run in kernel mode, since it is the operating system. The virtual machine itself can execute in only user mode 	[6]	1	L2
3	<p>Compare various approaches for designing operating System structure.</p> <p>Approaches (2 Marks) Simple/Monolithic Structure Micro-Kernel Structure Hybrid-Kernel Structure Exo-Kernel Structure Layered Structure Modular Structure Virtual Machines</p> <p>Simple: Such operating systems do not have well-defined structures and are small, simple, and limited. The interfaces and levels of functionality are not well separated (2 Marks)</p> <p>Micro – Kernel: This structure designs the operating system by removing all non-essential components from the kernel and implementing them as system and user programs. (2 Marks)</p> <p>Layered: An OS can be broken into pieces and retain much more control over the system. In this structure, the OS is broken into a number of layers (levels). The bottom layer (layer 0) is the hardware, and the topmost layer (layer N) is the user interface (2 Marks)</p> <p>Modular : The kernel has only a set of core components and other services are added as dynamically loadable modules to the kernel either during runtime or boot time.(2 Marks)</p>	[10]	1	L4

4	<p>What is a Process? Give the process State Diagram clearly stating the conditions for a process to shift from one state to another and also Explain PCB.</p> <p>Process : A process is a program under execution. (1 Mark)</p> <p>Give the process State Diagram clearly stating the conditions for a process to shift from one state to another (2 Mark)</p> <p>Five states: new, ready, running, blocked, and exit.</p> <p>A process is running if the process is assigned to a CPU. A process is removed from the running state by the scheduler if a process with a higher priority becomes runnable. A process is also pre-empted if a process of equal priority is runnable when the original process consumes its entire time slice.</p> <p>A process is runnable in memory if the process is in primary memory and ready to run, but is not assigned to a CPU.</p> <p>A process is sleeping in memory if the process is in primary memory but is waiting for a specific event before continuing execution. For example, a process sleeps while waiting for an I/O operation to complete, for a locked resource to be unlocked, or for a timer to expire. When the event occurs, a wakeup call is sent to the process. If the reason for its sleep is gone, the process becomes runnable.</p> <p>PCB : For each process there is a Process Control Block (PCB), which stores the process-specific information. Explain with Diagram (2 Marks)</p>	[5]	1	L3
b	<p>List the different Services that an operating system provides and Explain.</p> <p>Services (any 5) (5 Marks)</p> <p>User Interface Program execution Input Output Operations Communication between Process File Management Memory Management Process Management Error handling</p>	[5]	1	L3
5	<p>Explain System call with an example of handling a user application invoking the system call and its Types.</p> <p>System Call : System calls provides an interface to the services of the operating system.(1 Mark)</p> <p>Diagram : (3 Marks)</p>  <p>The diagram illustrates the system call process. At the top, a cloud labeled 'user application' is shown in 'user mode'. An arrow labeled 'open ()' points from the user application to a grey box labeled 'system call interface'. Below this interface is the 'kernel mode'. An arrow points from the interface to a vertical blue box containing dots, representing the kernel's internal state or data structures. From there, an arrow points to a block labeled 'Implementation of open () system call'. Finally, an arrow labeled 'return' points from the implementation back to the 'system call interface', which then returns to the 'user application' in 'user mode'.</p> <p>Explanation : (3 Marks)</p> <p>Types : (3 Marks)</p> <p>Process Control File Management Device Management Information Maintenance Communication</p>	[10]	1	L3

6	<p>Explain Inter process Communication and name the two major models of IPC.</p> <p>Interprocess Communication- Processes executing may be either co-operative or independent processes Cooperating processes require some type of inter-process communication. This is allowed by two models:</p> <ol style="list-style-type: none"> 1. Shared Memory systems 2. Message passing systems. (2 Marks) <p>Why Co-operation needed among processes (2 Marks)</p> <p>Shared Memory : Shared Memory is faster once it is set up, because no system calls are required and access occurs at normal memory speeds. Shared memory is generally preferable when large amount of information must be shared quickly on the same computer. Explain with Diagram (3 Marks)</p> <p>Message Passing requires system calls for every message transfer, and is therefore slower, but it is simpler to set up and works well across multiple computers. Message passing is generally preferable when the amount and/or frequency of data transfers is small. . Explain with Diagram (3 Marks)</p>	[10]	1	L3
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