Please do not read the questions until your class starts, and do not share this document.

There will be no marks for answering these questions correctly. On the other hand, if we find that you knew the questions and/or the answers before your class you will receive zero participation marks for that tutorial.

In all questions below, you need to choose **one answer**.

Q1. Consider implementing a device interface (i.e., handling communication between CPU and a device) in a device controller rather than in the OS kernel. Which of the following statements in INCORRECT?

A. Performance can be improved by hard-coded algorithms and utilizing dedicated hardware  
B. Device controller can introduce additional data buffering  
C. The kernel is simplified by moving algorithms out of it  
D. Improving algorithms requires a hardware update rather than just a device driver update  
E. Bugs are less likely to cause an OS crash, and bugs are easier to fix

Q2. Which statement about direct memory access (DMA) is CORRECT?

A. The DMA controller operates the memory bus by placing addresses on the bus to perform transfers with the help of the main CPU  
B. To initiate a DMA transfer, the host reads a DMA command block from the memory  
C. DMA increases system concurrency by allowing executing instructions in parallel for a larger number of processes  
D. In order to use DMA, hardware design becomes more complicated because the system must allow the DMA controller to be a bus master  
E. All the above statements are correct

Q3. Consider adding a new block at the beginning of a file currently consisting of 100 blocks. Assume that the content of the new block and the file-control block are already in memory. Calculate how many disk I/O operations are required for contiguous and linked allocation strategies. In the contiguous-allocation case, assume that there is no room to grow at the beginning but there is room to grow at the end. Assume that reading or writing a block takes one I/O operation. Don't include writing of the file-control block

A. contiguous = 1, linked = 101  
B. contiguous = 101, linked = 1  
C. contiguous = 201, linked = 100  
D. contiguous = 201, linked = 1  
E. contiguous = 202, linked = 100

Q4. Consider removing block #51 from a file currently consisting of 100 blocks (numbered from #1 to #100). Assume that the file-control block and the index block (in case of indexing allocation) are already in memory. Calculate how many disk I/O operations are required for linked and single-level indexed allocation strategies. Assume that reading or writing a block takes one I/O operation. Don't include writing the file-control block or index block

A. linked = 1, index = 0  
B. linked = 1, index = 1  
C. linked = 52, index = 0  
D. linked = 52, index = 1  
E. linked = 104, index = 52

Q5. Consider a system that supports the strategies of contiguous, linked, and indexed allocation. For a given file, the system captures file size and typical access pattern. Which allocation method is preferred in each of these cases?

A. Contiguous, if the file is small, doesn't change often and can be accessed randomly  
B. Contiguous, if the file changes often, and is usually accessed randomly  
C. Linked, if the file changes often, and is usually accessed randomly  
D. Linked, if the file doesn't change often, and is usually accessed randomly  
E. Indexed, if the file is small, doesn't change often and can be accessed randomly

Q6. Which of the following statement about file systems is INCORRECT?

A. There can be parts of secondary storage (HDD or SDD) not covered by any file system  
B. Mounting point is a dedicated file system that allows using the entirety of secondary storage (HDD or SSD)  
C. The same file system type can be used in different OS  
D. Disk fragmentation is not a concern for some file systems  
E. There are special-purpose file systems like the procfs, which is a file system that presents information on all processes as a file system

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