Operating Systems
Second Test, units 4, 5 and 6
2014-2015 academic year

Escuela de
Ingeniería Informática
Universidad de Oviedo

Scoring: for each question • *100% if right* • *-50% if wrong* • *0 if left unanswered*	*UO:* *Name:*	*Model 5*

True / False questions

IMPORTANT: Each question must be answered independently, as TRUE or FALSE.

1. Both protection and translation are performed by the Memory Management Unit in currently widespread processors.
True. Hardware performs those two functions.

2. In a virtual memory scheme with paging and TLB, some pages of the process are loaded into the TLB.
False. There are no pages in the TLB; it stores part of the page tables of the process.

3. In a virtual memory management system with segmentation, the concept of region (code, data, stack...) that it can share, protect, etc. is included. In a paging system there is no such thing.
True.

4. A virtual memory allocation scheme improves the degree of multiprogramming with respect to a physical memory allocation scheme.
True. The number of processes that can run simultaneously in memory increases.

5. Journaling provides a faster access to file data.
False. It helps keeping data consistency upon system failures.

6. To translate a virtual address to a physical address, the first thing to look up is the page table. If that fails, then the TLB is consulted.
False. It goes the other way around.

7. Each request received by the device handler generates an execution thread in the dependent device handler.
False. The dependent handler is a thread that processes a request and waits for its result before processing the next one.

8. Given a virtual memory management system with paging, using two-level page tables, each entry of the table taking 2 bytes and the page size being 2KB. Given a process with a size of 1 GB using only the lower 4,700,000 bytes (from 0 to 4,699,999). To store the page table 1,026 KB will be required.
False. In a 2-level page table only the pages needed in the second level are created. If only the first 4,700,000 bytes are used, that equals (4,700,000 / 2,048 = 2,294.92) 2,295 pages. To find these pages we divide 2,295 / 1,024 entries per table. So we need 3 second-level page tables and one first-level page table. That means 4 * 2 KB = 8 KB to store the page table. If all the address space was used, then 26 KB would be needed since 2 MB / 2 K = 512 K pages. Each table has 1,024 entries, we need 512 second-level tables + one first-level table. 513 * 2K = 1,026 K for the page table.

9. Let's suppose a file system with table indexed allocation (System V style). Each index table, no matter its level, has 13 entries, and the first one has 10 direct references, 1 indirect, 1 double indirect and 1 triple indirect. A file has 11 blocks: 54, 22, 45, 34, 35, 36, 129, 86, 470, 212, 46. The 11th entry of the first index table contains 46.
False. It contains a reference to another index table, that in turn points to 46.

10. Let's suppose a file system with table indexed allocation (System V style). Each index table, no matter its level, has 13 entries, and the first one has 10 direct references, 1 indirect, 1 double indirect and 1 triple indirect. A file has 28 blocks. It will need 3 index tables in total.
    False. It references 10 blocks in the first table, another 13 in the second, and in the third one, which is a double indirection table, there will be a reference to a fourth table that points to the blocks.

11. In virtual memory management, FIFO is a valid reading policy.
    False. FIFO is a replacement policy.

12. In virtual memory management, an LRU policy can be affected by Belady's anomaly.
    False. Belady's anomaly appears in FIFO.

13. The hardware controller of the device receives instructions from the operating system software controller (driver).
    True, they are the elements that communicate. The OS gives its instructions through the software controller, the hardware controller receives them and transmits them to the actual device.

14. Communication with hardware controller through ports uses privileged machine instructions.
    True. They are privileged so that they can only be executed in kernel mode, and only the OS can execute them.

15. Any user program can communicate directly with the hardware controller through port-in and port-out instructions.
    False. They cannot be used since they are privileged machine instructions. Only the OS can.

16. OS leaves in the control registers of the hardware controller the operation that the device must perform.
    True. Hardware controllers have control, data and status registers to communicate with the OS.

17. NTFS uses index tables for locating file blocks.
    False, it uses balanced trees.

18. Let's suppose a file system with table indexed allocation (System V style). Each index table, no matter its level, has 13 entries, and the first one has 10 direct references, 1 indirect, 1 double indirect and 1 triple indirect. A file has 28 blocks. It will need 4 index tables in total.
    True.

19. A transfer by DMA does not involve I/O interruptions.
    False. I/O interruptions are used. The controller sends the interruption when the transfer is complete.

20. Each request received by the device handler generates an execution thread in the independent device handler.
    True. A thread is generated that creates the request and passes it to the device dependent handler queue.

21. Clusters are sets of files of the same directory.
    False. They are block sets.

22. In a contiguous allocation system, the time the system needs to know where a file block is located depends on its position in the file (blocks near the end require more time to be found than blocks near the beginning).
    False. The time is the same (starting address + accessed byte).

23. A physical memory allocation scheme can produce page faults.
    False. Page faults appear only in virtual memory.

24. In a contiguous allocation scheme with fixed partitions, partition size depends on the size of the loaded processes.
False. In this scheme the partition size is set in advance and processes must be loaded into partitions of equal or greater size, wasting part of the space of that partition, which cannot be used for other process.

25. Given a virtual memory management system with paging, using one-level page tables only, with 4K pages. Given a process whose address space takes 47,982 bytes, that process will need a page table with 12 entries..
True. 47,982 bytes divided by the page size is 11.71. That implies 12 pages, and hence the table will need 12 entries.

26. When a device finishes an operation, it generates an interruption that will be sent the independent device handler.
False. They will be sent to the dependent handler that is waiting for that operation to end.

27. Memory paging is appropriate for region management.
False. There are no regions in paging. They do exist in segmentation.

28. Current systems translate logical to physical addresses at load time.
False. Current systems perform the translation at runtime by means of the Memory Management Unit.

29. Memory protection prevents access to memory addresses beyond the address space of the process trying to access.
True. The Memory Management Unit takes care of that before translating the address and locating its contents.

30. In a disk, the number of faces is the same as the number of R/W heads.
True.

31. Virtual memory relies on the locality principle.
True.

32. In a virtual memory management system with a 16-bit bus the logical address space could reach 2^16.
True.

33. Latency time depends on rotational speed.
Cierto.

34. The IORB queue is used by both the dependent and independent device handler.
True. The independent handler uses it to add the request and the dependent handler uses it to service the request.

35. If a hard disk has 256 sectors per cylinder, and 512 bytes per sector, 4 heads and a total capacity of 256 MB, we can infer that it has 2,048 tracks per face.
True. 256 * 512 = 131,072 bytes per cylinder. 256 MB / 131,072 B = 2,048 cylinders, so 2,048 tracks per face.

36. In I/O management, the device dependent software receives IORBs.
True.

37. In disk scheduling policies, FCFS is very easy to implement, and hence offers an excellent performance.
False. It's easy to implement, but it does not offer a good performance, since it does not minimize head movement.

38. In disk scheduling policies, the ones that can cause request starvation are FCFS and SSTF.

False. FCFS cannot cause starvation.

39. In disk scheduling policies, the only ones that treat all requests equally (i.e., do not favor central or extreme tracks) are Scan and Look.
False. Scan and Look favor central tracks. FCFS, C-Scan and C-Look do not favor any track.

40. Seek time depends on rotation speed.
False. The movement of a head does not depend on how fast the disk is rotating underneath.

41. A disk uses Look scheduling policy. The head is initially at cylinder 0. Pending requests are 10, 46, 90, 24, 57, 32. When it is processing cylinder 32, a request for 14 arrives. When it is processing cylinder 46, a request for 59 arrives. The request service order is: 10 24 32 46 57 59 90 14.
True.

42. A disk uses Look scheduling policy. The head is initially at cylinder 0. Pending requests are 10, 46, 90, 24, 57, 32. When it is processing cylinder 32, a request for 14 arrives. When it is processing cylinder 46, a request for 59 arrives. The request service order is: 10 24 32 46 57 90 59 14.
False. Request for 59 is not processed "when returning", but "when going".

43. The filesystems usually used in Windows and Linux generally interpret user files as a mere sequence of bytes.
True, no other interpretation is made, except in the format of some specific ones such as executable files or directories.

44. Executable files or text files are examples of files whose format is well known and interpreted by the operating system.
False, executable files are recognized by the system but text files are just considered a sequence of bytes.

45. Contiguous allocation of files is not used currently.
False. It's still used in CDs and the like.

46. Given a FAT32 filesystem with blocks of 512 bytes, and a file with the following blocks assigned to it: 1018, 456, 8358, 143, 294, 2984. To locate byte 3000 the system will access the FAT 5 times.
True. 3000 / 512 = 5.86. That means it has to get to the sixth block of the file (2984) and so 5 FAT entries must be visited.

47. Given an ext2 filesystem, with indexed allocation and 13-entries index tables, 512-bytes blocks, and a file that consists of the following blocks: 1018, 456, 8358, 143, 294, 2984. To locate byte 3000 the system will be faster than FAT32.
True, only one acces to the index table must be made, to position 9.

48. A block is the same as a sector.
False. It doesn't have to be the same. A block can contain several sectors.

49. In a clock-based virtual memory system, with an assigned physical memory of 4 frames, whose contents are: (Page=12|ref.bit=1) (15|1) (18|0) (45|1), and the "next frame pointer" points to the second one, when page 49 is requested, the second frame is used to load page 49, and page 15 leaves physical memory.
False. Second frame has its reference bit set to 1, so it will be lowered to 0 but it will not be used. The third one will be used.

50. In a clock-based virtual memory system, with an assigned physical memory of 4 frames, whose contents are: (Page=12|ref.bit=1) (15|1) (18|0) (45|1), and the "next frame pointer" points to the second one, when page 49 is requested, after servicing that request, the reference bit for second frame is 0.

True.

51. In a clock-based virtual memory system, with an assigned physical memory of 4 frames, whose contents are: (Page=12|ref.bit=1) (15|1) (18|0) (45|1), and the "next frame pointer" points to the second one, when page 49 is requested, the third frame is used to load page 49, and page 18 leaves physical memory.
True.

52. In a clock-based virtual memory system, with an assigned physical memory of 4 frames, whose contents are: (Page=12|ref.bit=1) (15|1) (18|0) (45|1), and the "next frame pointer" points to the second one, when page 49 is requested, after servicing that request, the "next frame pointer" points to the third one.
False. The third one has been used, so the pointer will reference the fourth.

53. In the ISO9660 file system, all the contents of a file are contiguous.
True.

54. In a virtual memory management system with paging, the page table of a process stores information that allows the system to detect the page faults for that process.
True. It's the presence bit that tells wheter the page is loaded or not.

55. In Unix System V filesystem, the total number of available i-nodes is dynamically adjusted depending on the needs.
False. Total number of i-nodes is fixed and it's set when the filesystem is created.

56. In NTFS, a file (even a a non-empty one) might not need any data block.
True. If it's small enough, it can fit in the metadata space.

57. In the file management system of an operating system, the virtual file system requests blocks directly to the device independent handler.
False. It requests them to the individual file system, that in turn requests them to the blocks server, that in turn deals with the handlers.

58. The DMA transfer mode allows the hardware controller to access main memory of the computer.
True, the controller itself performs the transfer of device data to the computer memory.

59. When a block is requested, if it's in the block cache, that request doesn't reach the device drivers (neither independent nor dependent).
True.

60. In the MFT of NTFS each file has an entry that is the root node of a balanced tree.
True.

61. A RAID 5 configuration distributes parity information across all the disks.
True.

62. Journaling and bitmaps are two techniques for making filesystems safer.
False. Journaling is, but bitmaps are for managing free space.