EXAM 1

CS 450 – Spring 2011

ANSWER KEY

Lane Department of Computer Science and Electrical Engineering
West Virginia University
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This is a closed book test. No notes or other resources are allowed. Read each question carefully and pace yourself. Put all answers on the exam paper, in the space provided.

1. (20 points: 2 each)

TRUE OR FALSE

a) A file is an example of a physical resource. *False*

b) Windows system administrators generally can do everything they need to do using the graphic user interface only. *False*

c) Timesharing was not feasible before the development of file systems. *True*

d) A process must always be in the ready state before changing to the running state. *True*

e) First-Come, First-Served scheduling provides the shortest average waiting time. *False*

f) In a typical computing system disk interrupts occur more often than any other type. *False*

g) Some OSs provide ID numbers for processes, but every system requires processes to have names. *False*

h) One important responsibility of a system call instruction is to put the hardware in privileged mode. *True*

i) MS-DOS was written from scratch by Bill Gates. *False*

j) If an OS supports virtual timers, the number of virtual timers equals the number of physical clocks. *False*

2. (20 points: 4 each)

Explain briefly each of the following terms.

a) Logical resource

A resource that does not correspond directly to a physical object. Examples include files, processes, messages, etc.

b) Job Control Language

A language used to specify instructions to the OS for processing a batch job. The JCL was an early type of user interface.

c) Fork and Exec

The two operations used to create a new process in Unix or Unix-based systems. Fork creates a clone of the original process, running the same code. Exec then optionally overlays one of the clones with a new program.

d) Feedback queues

A system of scheduling queues for processes in the READY state in an interactive timesharing system. Processes becoming ready are placed in the highest priority queue and given a short time quantum. If they complete quickly, they are considered interactive and will return to high priority. If they compute for a long time, they will migrate to lower priority queues with longer time quanta.

e) Interrupt Vector

A storage location in the low addresses of memory used to contain information such as a handler address used to process a particular type of interrupt.

3. (10 points)

An operating system is a manger of resources. Identify the two principal objectives of resource management, and give a brief example for each objective.

1) ***Convenient use.*** *An example is a file system, which makes it much more convenient to manage information on a storage device.*

2) ***Controlled sharing.*** *An example is a device allocation routine, which ensures that only one process at a time is permitted to use a particular device.*

4. (10 points: 2 each)

Match an OS from the list given to each of the descriptive phrases below. You may use the same name more than once. Here is the list:

SOS, SAGE, SABRE, ATLAS, OS/360, VMS, CTSS, MULTICS, T.H.E., UNIX, CP/M, Windows

1. First real-time operating system ___*SAGE*___
2. First OS with virtual memory ___*ATLAS*___
3. Its design was greatly influenced by VMS ___*Windows*___
4. A huge OS delivered very late and full of bugs ___*OS/360*___
5. A highly secure OS ___*MULTICS*___

5. (10 points: 5 each)

These questions concern the design of a user interface.

a) Identify two tasks normally performed by a terminal handler.

Some examples, as found in the text, include echoing, line buffering, handling break characters, etc. A brief phrase is sufficient.

b) Two common philosophies for the design of a command language are keyword arguments and positional arguments. Give one possible advantage of each approach.

KEYWORD: Better documentation, harder to make mistakes

POSITIONAL: Easier to type

6. (15 points: 5 each)

Name each of the three levels of process scheduling, and identify the resource or resources scheduled by each level.

1. ***High-level*** *or* ***long-term****: schedules complete* ***jobs***
2. ***Intermediate-level*** *or* ***medium-term****: schedules* ***memory***
3. ***Low-level*** *or* ***short-term****: schedules the* ***processor***

7. (15 points: 3 each)

Briefly explain five rules that should be followed in the design of a good interrupt handler.

LINKING TO THE INTERRUPT: A link must be established from the interrupt vector to the handler.

SAVING THE STATE: All registers must be saved and restored, since interrupts may occur at any time.

HANDLING PARAMETERS: Parameters cannot be passed in the normal way. They must be placed directly in registers or on the stack.

RESOURCE USE: No global data structures should be accessed, and no procedures called unless they are reentrant.

HANDLING OTHER INTERRUPTS: Provision must be made to handle other interrupts that may occur while the current one is being handled.

KEEPING IT SHORT: The handler must be as short as possible to avoid interference with other interrupts and to avoid side effects.