King Saud University
College of Computer and Information Sciences
CSC 227: Operating Systems
Time: 7:00pm – 8:30pm (90 minutes)

Total Marks: 24
Fall 2015-16
Midterm Exam I
Date: 21-03-2016

Name: .....
ID#: [redacted]
Section#:..... or Teacher Name: .....

Instructions:

- This exam has 9 pages including the title page and the back page.
- Do not use pencil.
- Write clearly and neatly.
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Question 1. [6 marks] Select ONLY ONE ANSWER (the best answer).
Copy your answer for question 1-1 to 1-12 in the table on page2. ONLY THAT TABLE WILL BE GRADED.

1.	Device controller informs CPU that it has finished its operation by causing _____
a.	system call
b.	trap
c.	interrupt
d.	exit from program

2.	A _____ is an example of an application program.
a.	command interpreter
b.	Web browser
c.	file management system
d.	loader

3.	A privileged instruction is ----------
a.	an instruction which can only be executed by a process with high priority.
b.	an instruction which starts an interrupt.
d.	an instruction which a user program often executes.
f.	an instruction which an operating system often executes.

4.	Starting a computer by loading the kernel is called ----------
a.	Booting
c.	Bootstrap program
e.	Boot lock
g.	loading

5.	Block and stack method of parameter passing are used for passing:
a.	Any number of parameters
b.	Integers
c.	Through register
d.	Through keyboard

6.	In microkernel communication takes place between user modules using ----------
a.	Bus
b.	Shared memory
c.	Message passing
d.	System call

7.	a) Considering the cloud computing, there are 3 categories of cloud services. One of them is Infrastructure as a Service (IaaS) What is the meaning of IaaS?
a.	The internet infrastructure is provided as a service.

8.	There are two methods to allow operating systems to run applications within other OSes. Emulation and virtualization. We call virtualization, when:
a.	The host and Guest OSes are compiled for the physical (real) CPU.

b.	Servers or storage available over Internet.
c.	One or more applications available via the Internet.
d.	Software stack ready for application use via the Internet

b.	The host OS is compiled for the physical (real) CPU while the guest CPU is compiled for another type of CPU
c.	The guest OS is compiled for the physical (real) CPU while the host CPU is compiled for another type of CPU
d.	The host and guest operating systems are compiled for a CPU type that is different from the physical (real) CPU

9.	When a process is created using the classical fork() system call, which of the following is not inherited by the child process?
a.	process address space
b.	process ID
c.	open files
d.	signal handlers

10.	The text segment of a process address space contains:
a.	the statically allocated data associated with the process
b.	the dynamically allocated data associated with the process
c.	the executable code associated with the process
d.	The inter-process communication (IPC) messages for the process

11.	Each process is represented in the operating system by:
a.	Accounting information
b.	Program Counter
c.	Process state
d.	a process control block ~ PCB

12.	State of a process that is not currently running, but is eligible to be scheduled
a.	waiting (I/O)
b.	ready
c.	~~running~~
d.	~~new~~

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
c ✓	b ✓	f ✓	a ✓	a ✓	c ✓	b ✓	✗ b	✗ d	c ✓

11.	12.
d ✓	b ✓

5/6

Question 2. [3.5 marks] 1.5/3.5

2-a) [0.5 marks] What is the difference between software and firmware? 0.5

Software : Collections of Programms that stored in desk

firmware : Code Stored in ROM/ERROM that helps Os to boot.

2-b) [1 mark] What is the difference between a disk controller and a disk driver? 1

disk driver : is interface between Os & disk controller

disk controller : manage I/O disk activites

2-c) [1 mark] Direct memory access is useful in a multi-programming system, given one main condition. What is it? (DMA) zero

~~[illegible]~~

instead of moves bits by bit and intrupt CPU each time we use DMA to moves bits by block with one intrupt

2-d) [1 mark] List the main types of interrupts.

1. vector interrupts
2. polling

)X zero

RTX, SRT, Mopar or No Car?

Question 3. [3.5 marks] 3/3,5

3-a) [0.5 marks] In the context of a mono-CPU computer, when the dispatcher inserts a user program in the CPU for execution, the system sets a HW timer to send an interrupt after a certain period of time. Can the user process change the timer settings directly to obtain more execution time? Justify your answer?

0.5 No, it has no beliverages (in User Mode)

3-b) [1 mark] Hardware can be interrupted by a signal coming from one of the devices, while the software is interrupted by exception or traps. List a situation where the SW will be interrupted by: (exception) (trap)

0.5 exception : divide by zero ✓

Trap : ~~access non-authorized~~ resources ?

3-c) [1 mark] One of the operating system activities in connection with process management is "Suspending and resuming processes"

i) What does it mean to suspend a process?

0.5 change the status of process from "Running" to "waiting" or ready ??

ii) Give an example to the use of suspending and resuming processes:

0.5 ① Process time slice is finished or → Ready

② Process Request I/O or → waiting

③ Process Swaped to VM ?

3-d) [1 mark] Multiprocessor environment must provide cache coherency in hardware? What does it mean?

✓ a Process (A) shouldn't write or change data of Process (B) untill we ensure the data are All saved in both side

{ Process(B) + its own data }

estion 4. [3.5 marks] 2.5

Command line interface

4-a) [1 mark] What is the advantage of implementing CLI as system program instead of making it part of kernel?

increase variety (Like in linux)

4-b) [1 mark] Why is the use of API preferred over direct use of system call?

to hide the internal implemetation of system calls. 1

4-c) [1.5 mark] SYSGEN is used to configure OS on a computer. How it works?

~~[illegible]~~

Used to Configure the required modules wanted in Os. 1.5

Question 5. [3.5 marks]

5-a) [2 marks] Internal structure of different operating systems can vary widely. The design of an operating system is influenced by the user goals and the system goals.

i) Write four possible user goals.

① Performance
② Usability
③ Security
④ reliability

ii) Write four possible system goals.

① Shared-resources
② [illegible]
③ multi-Programming
④ multi-tasks

5-b) [1 mark] The separation of policy from mechanism is a very important principle when building operating systems. Explain this principle.

- Policy: what Should be done
- Mechanism: How Should be done

5-c) [0.5 mark] One of the design techniques used in operating systems is microkernel. Explain two basic ideas in the microkernel design.

moves some of modules from kernal-mode to user mode

0.5

3

2

Question 6. [4 marks]

6-a) [1.5 marks] As a process executes, it changes state. The state of a process is defined as the current activity of the process. Give the name and description of each of the five states that a process can have at a time.

1.5

① New : already intuted
② Ready : All nessury resources are allocated in memory
③ Running : executing in CPU
④ waiting : requesting I/O
⑤ tremanted : executing finished

6-b) [1 mark] Processes within a system may be independent or cooperating. What are the reasons for cooperating processes? (1 Points)

share the available resources 0.5

6-c) [1.5 mark] What are the models of IPC? (1 Points) (Inter-process-Communication)

① shared-memory ✓
② pipe ✓
③ message Passing ✓

1

3