King Saud University
College Of Computer and Information Sciences
Computer Science Department
CSC 227: Operating Systems

Total Marks: 25 **Serial #**
Spring 2015-16 **Name:** ……
Midterm Exam I **ID#:** ……
Date: 17-July-2015 **Section#:**…… **or Instructor Name**: ……

Question 1. [10 marks] Select ONLY ONE ANSWER (the best answer).
Copy your answer for question 1-1 to 1-15 in the table on page2. ONLY THAT TABLE WILL BE GRADED.

1.	**The processor can transit from kernel mode to user mode, if _____**		**2.**	**_____specifies the location of next instruction to execute.**
a.	the user executes a privileged instruction		a.	Instruction register
b.	I/O is completed		b.	Cache coherency
c.	the user executes a trap instruction		c.	Program counter
d.	None of the above		d.	None of the above
3.	**_____ is an operating system function that controls the order and time in which programs are run**		**4.**	**_____ is an operating system function that manages the placement of programs and data in memory.**
a	File Management		a	Task Management
b	Job Scheduling		b	Device Management
c	Task Management		c	Job Management
d	I/O Management		d	Memory Management
5.	**_____ implies that a computer is simultaneously running two**		**6.**	**_____ is used to allows execution of processes not completely in memory**

	or more programs (task) at the same time			
a.	Client		a.	Bootstrap program
b.	Multitasking		b.	Main memory
c.	Cursor		c.	Virtual memory
d.	Mouse		d.	Dual mode
7.	**Bootstrap program is stored in _____.**		**8.**	**The _____ routine determines the nature of the interrupt and performs whatever actions are needed.**
a.	magnetic disks		a.	interrupt handler
b.	Read Only Memory (ROM)		b.	device controller
c.	Random Access memory (RAM)		c.	program handler
d.	tap drivers		d.	interrupt signal
9	**_____ is a program that assists the user in maintaining a computer's magnetic disks to ensure optimal performance**		**10**	**_____ is a program that accepts requests for action from the operating system and causes a device, such as a printer, to execute the requests**
a.	File Compression		a.	Utility
b.	Storage Management		b.	Driver
c.	File Management		c.	Taskbar
d.	Mass Storage Management		d.	Icon

11	When a process makes an I/O operation during execution its state changes from		12	Which of the following is not contained (saved) in a PCB?

	Ready to waiting			Program counter (A
	Running to ready			CPU registers (B
	Running to waiting			A list of open files (C
	Running to terminated			Non of the above (D
13	When a process makes an I/O operation during execution its state changes from		14	A CPU-bound process spends most of its time
	Ready to waiting			either executing or in the ready queue (A
	Running to ready			waiting in some I/O device queue (B
	Running to waiting			waiting for some interrupt to occur (C
	Running to terminated			waiting for some resource to be available (D
15	The scheduler that selects the process that should be executed next is called		16	A Zombie process is
	Short-term scheduler (A			a process whose parent terminated without invoking wait(). (A
	Long-term scheduler (B			A process that executes concurrently with its parent process (B
	Medium-term scheduler (C			A process that shares the same resources with its parent. (C
	Any of the above can do that (D			a process that terminates but its parent has not invoked wait() is called (D
17	The context-switch time is:		18	Which of the following statements is true?
	dependent on the underlying hardware support (A			In single core processors, shared memory is typically faster than message passing (A
	The size and complexity of the PCB (B			Message passing is most useful for exchanging large amounts of data. (B
	The size of the ready queue (C			Share memory is more suitable for distributed systems (C
	A and B only (D			All of the above
19	Rendezvous synchronization occurs when			The dynamically allocated objects are stored in
	The sender uses blocking send and the receiver, uses a non-blocking receive. (a			a) Stack
	The sender uses a blocking send and the receiver uses a blocking receive. (b			b) Heap
	If both send and receive are non-blocking (c			c) Text section
	None of the above (d			d) Data section

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

11.	12.	13.	14.	15.	16	17	18	19	20

Q 2

A) What is the purpose of system programs?

System programs can be thought of as bundles of useful system calls. They provide basic functionality to users so that users do not need to write their own programs to solve common problems.

B) What is the purpose of system calls?

System calls allow user-level processes to request services of the operating system.

C) Explain how does the CPU know when the memory operations are complete.

When the device is finished with its operation, it interrupts the CPU to indicate the completion of the operation.

Q3)

a) Explain why we cannot store global variables in the stack of a process.

Because we need to be able to access, them from any method/procedure and storing them in the stack would make them available to one method not to all methods

b) Explain why a long-term scheduler needs to select a good mix of I/O-bound and CPU-bound processes?

To make best use of the system resources. If all process are CPU bound then the I/O devices would stay idle. Similarly, if all processes are I/O bound processes, the CPU would be idle most of the time.

Q) Consider the following Java program for socket communication

```
import java.net.*;
import java.io.*;

public class DateServer
{
   public static void main(String[] args) {
      try {
         ServerSocket sock = new ServerSocket(6013);

         /* now listen for connections */
         while (true) {
            Socket client = sock.accept();

            PrintWriter pout = new
             PrintWriter(client.getOutputStream(), true);

            /* write the Date to the socket */
            pout.println("Hello User ");

            /* close the socket and resume */
            /* listening for connections */
            client.close();
         }
      }
      catch (IOException ioe) {
         System.err.println(ioe);
      }
   }
}
```

1)

2)

3)

a) What is the port number used by the program?

Answer: 6013

b) Explain the purpose of the statement labeled as 2 in the program

Answer: Makes the server listen to client requests. When a request is received, it is accepted and the next instruction is executed.

c) When does statement 3 execute?

Answer: Only when a client makes a request.

d) What would a client receive as a result of using (communicating with) this server?

Answer: Hello user

Q) A summing that we use a circular array of size n to implement a bounded buffer with two variables in and out. Where in points to the next available position and out points to the first full position.

a) Write the code for the producer.

b) Write the code for the consumer

A) In designing an operating system, the separation of policy and mechanism is an important principle. Explain why.

it allows maximum flexibility if policy decisions are to be changed later

B) List two advantages for using a microkernel Operating system structure

Any two of these

- Easier to extend a microkernel (All new services are added to user space and consequently do not require modification of the kernel)
- Easier to port the operating system to new architectures (a few modifications)
- More reliable (less code is running in kernel mode)
- More secure