Ministry of Higher Education
Saudi Electronic University
College of Computing and Informatics

Midterm Examination Cover Sheet

First Semester: 1436-1437 / 2015-2016

Course Instructor:		**Exam Date:**	**29/10/2015**
Course Title:	**Operating Systems**	**Course Code:**	**IT 241**
Exam Duration:	**60 Minutes**	**Number of Pages:** (including cover page)	**8**

Exam Guidelines

- **Mobile phones are not permitted.**
- **Calculators are permitted.**
- **Calculator sharing is NOT allowed.**

Marking Scheme

Questions	Score
Q1 (15 Marks)	/
Q2 (10 Marks)	/
Q3 (5 Marks)	/
Q4 (7 Marks)	/
Q5 (7 Marks)	/
Q6 (6 Marks)	/
Exam Score	/
Final Score	/ 25

Student Name:	**Student ID:**

Question 1: MULTIPLE CHOICE QUESTIONS
[15 MCQs of 15 Marks]

1. The two separate modes of operating in a system are
   a. supervisor mode and system mode
   b. kernel mode and privileged mode
   c. physical mode and logical mode
   d. user mode and kernel mode

2. The most common secondary storage device is _____.
   a. random access memory
   b. solid state disks
   c. tape drives
   d. magnetic disk

3. provided by an operating system.
   a. Shared memory
   b. System calls
   c. Simulators
   d. Communication

4. ______ is not one of the major categories of system calls.
   a. Process control
   b. Communications
   c. Protection
   d. Security

5. The _____ of a process contains temporary data such as function parameters, return addresses, and local variables.
   a. text section
   b. data section
   c. program counter
   d. stack

6. The list of processes waiting for a particular I/O device is called a(n) _____.
   a. device queue
   b. ready queue
   c. interrupt queue
   d. process queue

7. The ____ multithreading model multiplexes many user-level threads to a smaller or equal number of kernel threads.
   a. many-to-one model
   b. one-to-one model
   c. many-to-many model
   d. many-to-some model

8. A ____ provides an API for creating and managing threads.
   a. set of system calls
   b. multicore system
   c. thread library
   d. multithreading model

9. ____ is the number of processes that are completed per time unit.
   a. CPU utilization
   b. Response time
   c. Turnaround time
   d. Throughput

10. ____ scheduling is approximated by predicting the next CPU burst with an exponential average of the measured lengths of previous CPU bursts.
    a. Multilevel queue
    b. RR
    c. FCFS
    d. SJF

11. A race condition ____.
    a. results when several threads try to access the same data concurrently
    b. results when several threads try to access and modify the same data concurrently
    c. will result only if the outcome of execution does not depend on the order in which instructions are executed
    d. None of the above

12. A counting semaphore ____.
    a. is essentially an integer variable
    b. is accessed through only one standard operation
    c. can be modified simultaneously by multiple threads
    d. cannot be used to control access to a thread's critical sections

13. A deadlocked state occurs whenever ____.
    a. a process is waiting for I/O to a device that does not exist
    b. the system has no available free resources
    c. every process in a set is waiting for an event that can only be caused by another process in the set
    d. a process is unable to release its request for a resource after use

14. An address generated by a CPU is referred to as a ____.
    a. physical address
    b. logical address
    c. post relocation register address
    d. Memory-Management Unit (MMU) generated address

15. _____ is the dynamic storage-allocation algorithm which results in the smallest leftover hole in memory.
    a. First fit
    b. Best fit
    c. Worst fit
    d. None of the above

Question 2: TRUE OR FALSE QUESTIONS [10 MARKS]

1. Solid state disks are considered volatile storage. False
2. Monitors are a theoretical concept and are not practiced in modern programming languages . False
3. As the process executes it changes its state. True
4. Each thread has its own register set and stack. True
5. The value of a counting semaphore can range only between 0 and 1. False
6. The circular-wait condition for a deadlock implies the hold-and-wait condition. True
7. Deadlock prevention and deadlock avoidance are essentially the same approaches for handling deadlock. False
8. CPU utilization keeps the CPU as busy as possible. True
9. Mobile operating systems typically support swapping. False
10. In RR scheduling, the time quantum should be small with respect to the context-switch time. False

Question 3: FILL IN THE BLANKS **[5 MARKS]**

Circular wait	Hold and wait	Mutex lock	Exception
Counting semaphore	Communication	Trap	Bootstrap

1. Communication Provide the mechanism for creating virtual connections among processes, users, and computer systems.

2. ATrap or exception is a software-generated interrupt caused either by an error or a user request.

3. One necessary condition for deadlock is circular wait, which states that there is a chain of waiting processes whereby P_0 is waiting for a resource held by P_1, P_1 is waiting for a resource held by P_2, and P_n is waiting for a resource held by P_0.

4. A mutex lock is essentially a boolean variable.

Question 4: **[7 marks]**

Describe four components of computer system?

Answer. Computer system can be divided into four components:

- Hardware
  - CPU, memory, I/O devices
- Operating system
  - Controls and coordinates use of hardware among various applications and users
- Application programs
  - Word processors, compilers, web browsers, database systems, video games
- Users
  - People, machines, other computers

Question5: **[7 marks]**

Explain the basic method for implementing paging.

Physical memory is broken up into fixed-sized blocks called frames while logical memory is broken up into equal-sized blocks called pages. Whenever the CPU generates a logical address, the page number and offset into that page is used, in conjunction with a page table, to map the request to a location in physical memory.

Question 6: **[6 marks]**

Describe the dining-philosophers problem and how it relates to operating systems.

The scenario involves five philosophers sitting at a round table with a bowl of food and five chopsticks. Each chopstick sits between two adjacent philosophers. The philosophers are allowed to think and eat. Since two chopsticks are required for each philosopher to eat, and only five chopsticks exist at the table, no two adjacent philosophers may be eating at the same time. A scheduling problem arises as to who gets to eat at what time. This problem is similar to the problem of scheduling processes that require a limited number of resources.