Philadelphia University Faculty of Engineering Department of Computer Engineering		Date:- 31/12/2015 Allowed time:- 60 minutes

Operating Systems (630422) **Second Exam**

Student Name: - ……..... ID: - ……

Question 1: chose the correct answer for the following questions. **10 points**

1- Which of the following is true of cooperative scheduling?

A) It requires a timer.
B) A process keeps the CPU until it releases the CPU either by terminating or by switching to the waiting state.
C) It incurs a cost associated with access to shared data.
D) A process switches from the running state to the ready state when an interrupt occurs.

2- Which of the following scheduling algorithms must be nonpreemptive?

A) SJF B) RR C) FCFS D) priority algorithms

3- _____ allows a thread to run on only one processor.

A) Processor affinity B) Processor set C) NUMA D) Load balancing

4- With _____ a thread executes on a processor until a long-latency event (i.e. a memory stall) occurs.

A) coarse-grained multithreading B) fine-grained multithreading
C) virtualization D) multicore processors

5- 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

6- In Peterson's solution, the ____ variable indicates if a process is ready to enter its critical section.

A) `turn` B) `lock` C) `flag[i]` D) `turn[i]`

7- A(n) _____ refers to where a process is accessing/updating shared data.

A) critical section B) entry section C) mutex D) test-and-set

8- One necessary condition for deadlock is ____, which states that at least one resource must be held in a nonsharable mode.

A) hold and wait B) mutual exclusion C) circular wait D) no preemption

9- A cycle in a resource-allocation graph is ____.

A) a necessary and sufficient condition for deadlock in the case that each resource has more than one instance
B) a necessary and sufficient condition for a deadlock in the case that each resource has exactly one instance
C) a sufficient condition for a deadlock in the case that each resource has more than once instance
D) is neither necessary nor sufficient for indicating deadlock in the case that each resource has exactly one instance

10- Suppose that there are 12 resources available to three processes. At time 0, the following data is collected. The table indicates the process, the maximum number of resources needed by the process, and the number of resources currently owned by each process. Which of the following correctly characterizes this state?

Process	Maximum Needs	Currently Owned
P_0	10	5
P_1	4	1
P_2	8	4

A) It is safe. B) It is not safe.
C) The state cannot be determined. D) It is an impossible state.

Question 2: Distinguish between coarse-grained and fine-grained multithreading. 2 points

(1) Coarse-grained multithreading allows a thread to run on a processor until a long-latency event, such as waiting for memory, to occur.
(2) Fine-grained multithreading switches between threads at a much finer-granularity, such as between instructions.

Question 3: Assume you had a function named update() that updates shared data. Write a code to describe how a mutex lock named mtx might be used to prevent a race condition in update(). 2 points

```
void update()
{
      mutex.acquire();

      // update shared data

      mutex.release();
}
```

Question 4:- What are the three general ways that a deadlock can be handled? 1 point

1- A deadlock can be prevented by using protocols to ensure that a deadlock will never occur.
2- A system may allow a deadlock to occur, detect it, and recover from it.
3- operating system may just ignore the problem and pretend that deadlocks can never occur.

Question 5: What is one way to ensure that a circular-wait condition does not occur? 1 point

The operating system impose a total ordering of all resource types
The operating system require that each process requests resources in an increasing order of enumeration.

Question 6: Given the following data collected from the system. Using banker's algorithm determine whither the system in safe state or not. 4 points

A (10 instances), *B* (5instances), and *C* (7 instances)

	Allocation	*Max*	*Available*	*Need*	*work*
	A B C	*A B C*	*A B C*	*A B C*	*A B C*
P_0	0 1 0	7 5 3	3 3 2	*7 4 3*	*step1 3 3 2*
P_1	2 0 0	3 2 2		*1 2 2*	*step 2 (serving P1) 5 3 2*
P_2	3 0 2	9 0 6		*6 0 4*	*step 3 (serving P3) 7 4 3*
P_3	2 1 1	2 2 2		*0 1 1*	*step 4(serving P0) 7 5 3*
P_4	0 0 2	4 3 6		*4 3 4*	

Step5 : P2 and P4 cannot be served so the system is not in safe state