United International University
Department of Computer Science and Engineering

CSI 309: Operating System Concepts Final Examination : Spring 2018

Total Marks: 40 Time: 2 hours

Answer all the 4 questions. Numbers to the right of the questions denote their marks.

1. (a) Suppose two interactive systems schedule their processes with Round-Robin scheduling algorithm. Only difference is, time quantum of first system is 5 seconds whereas for the second system it is 20 seconds. Which system has better (i)Throughput (ii)CPU Utilization (iii) Response Time? Give brief explanation supporting your answer. [1+1+1]

   (b) A given system follows dynamic priority scheduling scheme with time quantum 50ms. There are three processes (A, B and C) in the system. Remaining CPU bursts of A=(10ms → 30ms → 15ms), B=(40ms → 30ms) and C=(5ms → 45ms → 25ms). Initial priority for all of the processes is set to infinity. Show scheduling simulation with necessary calculations and Gantt chart. Note: Operating system will not allocate two consecutive time slots for a same process if there exists other runnable process. [5]

   (c) What are the four solution requirements that need to satisfy for smooth inter-process communication? [2]

2. (a) What is *critical region*? To protect critical region, lock variable is used in the following code:

```
int lock = 0;
while (lock);
lock = 1;
//EnterCriticalSection;
access shared variable;
//LeaveCriticalSection;
lock = 0;
```

   Does this code work? Explain. [1+2=3]

   (b) What is Priority Inversion Problem? Explain. [2]

   (c) Briefly explain how *Semaphore* solves the *critical region* problem in multi-processing environment. [5]

3. (a) Suppose there are four processes: A, B, C, D and five resources: R1, R2, R3, R4, R5. Find if the following state results in deadlock where Available matrix is [1 1 1 1 1] . [5]

Table 1: Current Allocation Matrix

	R1	R2	R3	R4	R5
A	2	0	1	1	3
B	1	1	2	0	0
C	0	1	1	2	1
D	0	1	2	0	2

Table 2: Resources Total Needed

	R1	R2	R3	R4	R5
A	3	1	1	3	3
B	2	2	3	1	1
C	1	1	2	2	1
D	1	2	2	1	3

   (b) Suppose, process X needs resource R1 from instruction# 100 to instruction# 200. Process Y needs resource R1 from instruction# 200 to instruction# 300. Also, process X needs resource R2 from instruction# 50 to instruction# 150. Process Y needs resource R2 from instruction# 150 to instruction# 250. Is there any unsafe state? If yes, show it on a graph. [3]

   (c) Write the difference of preemptive resource and non preemptive resource. [2]

4. (a) Describe 'hard linking' for shared files. [2]

(b) Suppose, there are 12 blocks in a secondary storage disk. The blocks are numbered from 0 to 11. Block 0, 2, 4,5,6, 7,10,11 are free, the rest are allocated to files. Now allocate blocks for file A (size = 3 blocks) and then file B (size = 2 blocks) using (i) contiguous file allocation (ii) linked list allocation using a table in memory. Note that you have to allocate files A and B sequentially. [2+2=4]

(c) Write the disadvantages of (i) contiguous file allocation (ii) linked list allocation using a table in memory. [2]

(d) Suppose Rim wants to travel to London. For that he has to get his visa, then buy tickets, then book hotel. All three tasks have to be done sequentially. Now design three functions get_visa(), buy_tickets() and book_hotel() so that it ensures that the tasks take place sequentially. [2]