

Operating System (CS-33101)
MCA – 3rd Semester
Assignment 4

Q.1. A shared variable x , initialized to zero, is operated on by four concurrent processes W, X, Y, Z as follows. Each of the processes W and X reads x from memory, increments by one, stores it to memory, and then terminates. Each of the processes Y and Z reads x from memory, decrements by two, stores it to memory, and then terminates. Each process before reading x invokes the P operation (i.e., wait) on a counting semaphore S and invokes the V operation (i.e., signal) on the semaphore S after storing x to memory. Semaphore S is initialized to two. What is the maximum possible value of x after all processes complete execution?

Q.2. The following two functions P1 and P2 that share a variable B with an initial value of 2 execute concurrently. What is the number of distinct values that B can possibly take after the execution?

<pre>P1 () { C = B - 1; B = 2*C; }</pre>	<pre>P2 () { D = 2 * B; B = D - 1; }</pre>
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Q.3. Enabling and disabling interrupts to prevent timer interrupts from invoking the scheduler is one way to implement semaphores. This technique can influence I/O because it makes the interrupt handler wait until the interrupts become enabled before the handler can complete an I/O operation. Explain how this could affect the accuracy of the system clock.

Q.4. Consider the following snapshot of a system in which four resources A, B, C and D are available. The system contains a total of 6 instances of A, 4 of resource B, 4 of resource C, 2 of resource D.

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	2	0	1	1	3	2	1	1	6	4	4	2
P1	1	1	0	0	1	2	0	2				
P2	1	0	1	0	3	2	1	0				
P3	0	1	0	1	2	1	0	1				

Do the following problems using the banker's algorithm:

- (i) Compute what each process might still request and fill this in separate column Need.
- (ii) Is the system in a safe state? Why or why not?
- (iii) Is the system deadlocked? Why or why not?
- (iv) If a request from P3 arrives for (2, 1, 0, 0), can the request be granted immediately?

Q.5. Clearly justify why deadlocks cannot arise in a bounded buffer producers-consumers system.