

CSCI 56500 – Fall 2011

Assignment Number 3

Due Date: December 1, 2011

1. Write a Prolog program to calculate the Fibonacci Numbers. Fibonacci numbers are determined as:

```
fib(n) = fib (n-1) + fib (n-2), if n > 1
fib(1) = 1
fib(0) = 0
```

2. Modify the *append list program* discussed in the class so as to add the *delete* and the *reverse* functions.
3. Modify the *append list program* discussed in the class so as to add the *prefix* and the *suffix* functions.
4. Write a Prolog program to implement the power function.
5. Implement the bounded buffer problem, discussed in chapter 7, using Java's thread utility.
6. What is a semaphore and what are its properties?

- (a) A program consists of two procedures, P1 and P2. These procedures share a semaphore called *mutex*. The pseudo-codes of these procedures are:

| | |
|------------------|------------------|
| P1 | P2 |
| ----- | ----- |
| signal(mutex); | signal(mutex); |
| | |
| Critical Section | Critical Section |
| | |
| wait(mutex); | wait(mutex); |

Where *signal* and *wait* have usual meanings.

Determine if P1 and P2 will achieve mutual exclusion, i.e., at a time only P1 or P2 will be in its critical section. Justify your answer.

- (b) Assume that only the code of P1 is changed and the new codes are shown below:

| | |
|------------------|------------------|
| P1 | P2 |
| ----- | ----- |
| wait(mutex); | signal(mutex); |
| | |
| Critical Section | Critical Section |
| | |
| wait(mutex); | wait(mutex); |

What will happen in this case?

7. What are the advantages of a Conditional Critical Region?
8. Describe the concept of monitors.
9. What are possible solutions to the nested-monitor problem?
10. Are crowd monitors different from monitors? If so, how?
11. Briefly discuss event counts, sequencers and barriers.
12. Suggest solutions for the problems of starvation and deadlocks.
13. As per Bal, et al, what is the definition of distributed computing?
14. Why distributed computing is needed?
15. What are the requirements for distributed programming support?
16. Discuss physical and logical distribution.
17. What features should a language have to support programming for distributed systems?
18. What are different units of parallelism?
19. What mechanisms are used for inter-process communication?
20. Which factors affect message passing?
21. Discuss various communication alternatives that are available for inter-process message passing.
22. Describe the data sharing paradigm.
23. How does Linda achieve data sharing?
24. What special property the shared logical variables have?
25. What are different approaches for programming fault tolerance?