



## **IT PROGRAMMING AND AUDIT**

### **SAMPLE QUESTIONS**

**1.** Modern instruction set architectures provides instructions for performing atomic operations over memory locations.

(i) One class of instructions is generically referred to as Compare And Swap (CAS). Describe how the CAS instruction on the x86 architectures is used to perform an atomic operation. Briefly explain how the instruction uses the instruction operands when executed.

(ii) Databases often utilise a technique known as write-ahead logging to provide durability guarantees. Describe how a disk-based transaction log might be implemented, and what the atomic operation used in this technique is.

2. The below snippet of C code uses pthreads for concurrent execution. It uses a mutex **M** and a condition variable **C** to ensure that the run critical code function only executes when the condition boolean is true.

```
L1: pthread_mutex_lock(&M);
L2: run_critical_code ();
L3: if (! condition)
L4: pthread_cond_wait(&C, &M);
L5: if (! condition)
L6: pthread_cond_broadcast(&C);
L7: pthread_mutex_lock(&M);
```

Unfortunately, there are four bugs in the code that prevent it from working correctly. List each of the four bugs and describe how each bug affects programme execution. Write down a new version of the code snippet with the four bugs corrected

3. (a) Write a LISP program for detecting whether a LISP interpreter treats the language as being dynamically scoped (as was the case in historical LISP) or as being statically scoped (as is the case in modern LISP). You may use pseudo-code and should explain your answer in detail.

(b) You manage two junior programmers and overhear the following conversation:

A: I don't know why anyone needs a language other than Java, it provides clean thread-based parallel programming."

B: Maybe, but I write my parallel programs in a functional programming language because they are then embarrassingly parallel."

Discuss the correctness of these statements and the extent to which they cover the range of languages for parallel programming.

4. Discuss the importance of Computer Assisted Audit Techniques and Tools (CAATTs).

5. Congratulation, you have been recruited as the Chief IT auditor for your company.

(i) Discuss the importance of IT audit to your company as well as the cost to the company should the company fail to institute an IT audit system.

(ii) Draft an IT audit manual for the company.