Foundations of Computer Science

Describe how ML lists are represented in storage. Your answer should include diagrams illustrating how the representation of \([a, b]@[c, d]\) is derived from those of the lists \([a, b]\) and \([c, d]\), indicating any sharing of memory. How efficient is the evaluation of \([a, b]@[l]\) if the list \(l\) is very long? [4 marks]

What are cyclic lists and how can they be created in ML? [2 marks]

Describe ML’s reference types and their applications. In particular, compare mutable data structures with ordinary ML datatypes. [6 marks]

Code an ML function that takes a mutable list and returns true if the list is cyclic, otherwise returning false. Explain why your function is correct. [8 marks]

[Hint: in ML, the equality test \(p = q\) is permitted on references and is true if \(p\) and \(q\) refer to the same location in memory.]