2011 Paper 3 Question 4

Compiler Construction

(*a*) In a stack-based runtime system, what problem does the *static link method* attempt to solve, and how does it work? [4 marks]

(*b*) Can static linking be used to implement a language with first-class functions? If yes, then explain how. If no, give an example and explain how static linking fails. [6 marks]

(*c*) Explain how exceptions (ML-like `raise` and `handle`) could be implemented with a stack-oriented machine. [5 marks]

(*d*) A program may evaluate to an exception that has been raised all the way to the top-level and never handled. Discuss how you might modify your implementation in part (*c*) to dump debugging information when such top-level exceptions are raised. The debugging information should include some description of the state of the computation *just before the top-level exception was raised*. [5 marks]