

Assignment #6

Name: _____ ID: _____

This assignment has **3** questions, for a total of **25** marks.

Question 1: **Diverging with references** 7 marks

Using references, there exists a (syntactically) well-typed closed term that (i) does not use roll nor unroll and (ii) diverges. Write such a term, prove that it is well-typed and show that it diverges.

Question 2: **Progress** 8 marks
Write the proof for the progress theorem for the cases related to locations, allocation, dereferencing and update.

Question 3: **Natural numbers-based heap** 10 marks
In this exercise you will replace the abstract heap of System F with an assembly-like one. Drop all terms, types, typing rules, evaluation contexts and primitive reduction rules related to the heap with abstract locations. Add terms to perform the same instructions on a heap that is a map from natural numbers to values (Hint: to start, identify the type of locations). Show typing rules for heap-related terms as well as COS rules for heap-related terms.