MAU22C00: ASSIGNMENT 3
DUE BY FRIDAY, DEC. 18 BEFORE MIDNIGHT
UPLOAD SOLUTION ON BLACKBOARD

Please write down clearly both your name and your student ID number on everything you hand in. Please attach a cover sheet with a declaration confirming that you know and understand College rules on plagiarism. Details can be found on `http://tcd-ie.libguides.com/plagiarism/declaration`.

The assignment may be submitted without penalty until Wednesday, January 6 before midnight.

1) (40 points) Let L be the language over the alphabet $A = \{0, 1\}$ consisting of all words containing an even number of zeroes.

(a) Draw a finite state acceptor that accepts the language L. Carefully label all the states including the starting state and the finishing states as well as all the transitions. Make sure you justify it accepts all strings in the language L and no others.

(b) Devise a regular grammar in normal form that generates the language L. Be sure to specify the start symbol, the non-terminals, and all the production rules.

(c) Write down a regular expression that gives the language L and justify your answer.

(d) Prove from the definition of a regular language that the language L is regular.

2) (20 points) Let M be the language over the alphabet $\{a, r, c\}$ given by $M = \{a^i r^j c^k \mid i, j, k \geq 0 \quad i = 2j - k\}$.

(a) Use the Pumping Lemma to show this language is not regular.

(b) Write down the production rules of a context-free grammar that generates exactly M and justify your answer.