ToC 2017 – Assignment 2; For 25 Marks.

Give a CFG for problems **a, b, c, d** along with a formal proof (which is sound and complete) which establishes that your answer is correct. Problem **e** requires a formal proof which is sound and complete.

a) The set $\{0^n 1^n \mid n \geq 1\}$, that is, the set of all strings of one or more 0's followed by an equal number of 1's.

b) The set $\{a^i b^j c^k \mid i \neq j \text{ or } j \neq k\}$, that is, the set of strings of a's followed by b's followed by c's, such that there are either a different number of a's and b's or a different number of b's and c's, or both.

c) The set of all strings of a's and b's that are *not* of the form ww, that is, not equal to any string repeated.

d) The set of all strings with twice as many 0's as 1's.

e) Show that every regular language is a context-free language.
Hint: Construct a CFG by induction on the number of operators in the regular expression.