Computability

1. Consider the language given by the regular expression a*bc*. (a) Give a JFLAP implementation of a DFA that recognises this language, and test it on a suitable set of test data. (You need not include screen shots for each test screen, just give the trace of the DFAs behaviour on each.) (4 marks)

(b) Give a Type 3 grammar for this language and show how it produces those strings in your test data, which are accepted by your DFA. (4 marks)

S => => aA

=> bB

=> bC

=> b

A=> bB

=> bC

=> b

B=> aA

=> bB

=> bC

C=> b

=> aA

=> bB

=> cC

=> b

2. Consider the language {anbcn| n>= 1}.

(a) State the pumping lemma for regular languages and use it to show that this language is not regular. (4 marks)

Assume L={anbcn| n>= 1} is a regular language. Then pumping lemma holds.

Let p be the pumping length for L given by the lemma.

We choose S= apbcp {in L of length >= p}

Consider all cases s can be divided into x, y, z such that s= xyz satisfying

conditions of the pumping lemma | y| > 0 and | xy| s= abic for all i >= 0, lets

take i= 0

s= ab0c ==> s= ac

Therefore, L is not a regular language because s= ac does not satisfy the

pumping lemma.

(b) Show that this language is context free by giving a CFG for this language.

(3 marks)

L = {anbcn| n>= 1}

CFG = {V,{a, b, c}, P, S}

P:

S => abc

S => aSc

The lemma does not satisfy the language as a context-free grammar.

3. Consider the language {anb2ncn}.

(a) State the pumping lemma for context free languages and use it to show

that this language is not context free. (7 marks)

L= {anb2nc}

CFG = { V, {a, b, c}, P, S }

P:

S => abbc

S => aSbbc

S => aSbc

The lemma does not satisfy the language as a context-free grammar.

(b) Give a JFLAP implementation of a Turing Machine that decides this

language, and test it on a suitable set of test data.