CURTIN UNIVERSITY

DEPARTMENT OF COMPUTING

Theoretical Foundations of Computer Science

Interim Test

2nd Semester 2016

NAME: _____

STUDENT NUMBER: _____

Time Allowed: Sixty (60) minute test preceded by a 10 MINUTE READING PERIOD during which time notes may be made on the back page of the paper. The supervisor will indicate when answering may commence.

AIDS: None

INSTRUCTIONS: This paper consists of x+1 questions with a total of 60 marks.

ATTEMPT ALL QUESTIONS

No electronic devices such as Phones and PDA are allowed. All phones, even in a bag, must be turned off.

INSTRUCTIONS FOR QUESTIONS 1 TO x:

QUESTIONS 1 to x each describe a problem in English, set notation or in terms of strings. It is your task to do the following for each of the five:

Classify the problem into one the appropriate category; Regular, Context-Free or neither. You may instead state the tier (T1, T2 or T3+) if you prefer. **(4 marks)**
In addition:

1. For a problem that is Regular, prove that this is the case by constructing either a DFA, a NFA, or a Regular Expression that accepts the language of the problem. **(5 marks)**
2. For a problem that is Context-Free, do both of the following:
    a. Prove that the problem is not Regular using the pumping lemma. **(5 marks)**
    b. Prove that the problem is Context-Free by constructing either a PDA or CFG that accepts the language of the problem. **(5 marks)**
3. For a problem that is neither, explain why it is not Context-Free or Regular. **(2 marks)**

If you are unable to do a pumping lemma proof, a small amount of marks may be awarded for a good explanation of why the problem is not Regular.

You may choose to prove that something is not Regular using a method other than the pumping lemma, if you are sure that this form of proof is convincing. However, use of the pumping lemma is strongly recommended.

If you submit a classification for a question but give no reasoning (such as the information in points 1-3 above or a brief explanation) you will be given zero marks for that question.

QUESTION X+1 - Short Answer

Answer each of the following, being sure to state your reasoning. No marks will be given for an answer without reasoning or justification.

End of Test Questions