Midterm: CSE 425, CONCEPTS OF PROGRAMMING LANGUAGE

North South University
Fall 2019

Name: _____

Student ID: _____

Deduction due to misconduct:

Total Marks:

Instructions:

1. It is a close notes, close books exam.
2. You have $\geq$ **70 minutes** to complete the examination.
3. You may use a calculator.
4. Please sign the below Honor Code statement.

In recognition of and in the spirit of the North South University code of conduct, I certify that I will neither give nor receive unpermitted aid on this examination. Signature: _____

Answer the questions in the spaces provided. If you run out of room for an answer, continue on the back of the page.

Question 1: 16 Points

(a) What is von Neumann Bottleneck? What could be a possible solution of it? [4]

(b) Write down the difference between Parse Tree and Abstract Syntax Tree. Give an example of each. [4]

(c) Write short notes on– i) Extensibility, ii) Limitations of FORTRAN (initial), iii) Programmer Efficiency, iv) Orthogonality [8]

Question 2: 12 + 12 Points

(a) For a given set of alphabets $\Sigma = \{a, b, c\}$, describe (in English text) the languages generated by grammar below:
$S \rightarrow AB$
$A \rightarrow aAb \mid \epsilon$
$B \rightarrow bBc \mid \epsilon$
Your answer should be generic– that is, it should be true for all possible strings within the given language.

(b) Consider the below grammar for the alphabets $\Sigma = \{a, b\}$. Identify if there's any redundant rule included. If so, identify the redundant rule with proper justification.
$X \rightarrow bXa \mid bM$
$M \rightarrow bM \mid aM \mid \epsilon$

Question 3: 12 + 12 Points

(a) What are the alphabets of the below grammar? Draw the parse tree for the string *aadccb* and check if the below grammar is ambiguous. Show your derivations.
$X \rightarrow aX \mid XM \mid d$
$M \rightarrow Mb \mid c$

(b) Describe the language that the below grammar generates. Show that the grammar is ambiguous. Introduce necessary changes to the grammar to remove ambiguity.
$X \rightarrow *X \mid X* \mid a$

Question 4: 20 Points

For the grammar given below:
$X \rightarrow pXss \mid M$
$M \rightarrow qMr \mid qr$

(a) Show the leftmost derivation for the string $ppqqrrssss$ [10]

(b) Develop a parse tree for the leftmost derivation done in part 'a' [10]

Question 5: 10 + 12 Points

(a) Explain the concept of pass by value and pass by reference. Use a pseudo-code to demonstrate their differences. [10]

(b) For alphabets $\Sigma = \{a, b\}$, design CFG that recognizes languages given as– i) at least, it contains three a's, ii) contains more a's than b's. [12]