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**University Examinations 2016/2017**

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

**CCS 3429: COMPILER CONSTRUCTION**

**DATE: DECEMBER 2016 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two***questions.

**QUESTION ONE (30 MARKS)**

1. Describe the following concepts as used with compilers
2. Language processor
3. Preprocessor
4. Assembler
5. Source code
6. Ambiguity

(10 marks)

1. Using the source language and machine language combinations, describe the circumstances under which a compiler is not the appropriate language processor, giving reasons in each case. (6 marks)
2. Distinguish between the following
3. Translator and interpreter
4. Loader and linker
5. Syntax and semantics (6 marks)
6. Describe any four issues considered in the design of a code generator (8 marks)

**QUESTION TWO (20 MARKS)**

1. With the help of a diagram, describe the compilation process, specifying the input and output at each stage (10 marks)
2. Using the expression *a+b\*(c-d)+(c-d)\*a-b* to illustrate, describe the difference between a syntax tree and a DAG, and construct the respective trees. Assume the normal order of operator precedence (6 marks)
3. Describe a Finite State Automata and describe how it is used in language processing (4 marks)

**QUESTION THREE (20 MARKS)**

1. Consider the for-loop structure in either C++ or Java language.
2. Give the general structure of the loop (1 mark)
3. Generate a grammar for the loop structure (4 marks)
4. Show that the statement below is a sentence in the language of your grammar for **(x=3;x<=20;x=x+2)y=x+7;** (5 marks)
5. Construct a parse tree for the statement in (iii) above (4 marks)
6. Describe the three main tasks that comprise the code generation stage of a compiler (6 marks)

**QUESTION FOUR (20 MARKS)**

1. With the help of a diagram, describe the hierarchical structure of a programming language and how it influences the process of compilation (10 marks)
2. Given the intermediate code below, give the equivalent representation in target code, stating the assumptions made if any.

T1=x\*3

T2=y+2

T3=T1-4

T4=T2+T3

T5=T4 (5 marks)

1. Define code optimization and describe two techniques used for code optimization. (5 marks)

**QUESTION FIVE (20 MARKS)**

1. Using a relevant example to illustrate, describe the three forms of three address code representation (6 marks)
2. Using the structure of a computer, the types of computers and the type of machine language, describe the context within which compilers operate. (12 marks)
3. Describe two techniques used to eliminate ambiguity in a grammar (4 marks)