CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

**THIRD YEAR EXAMINATION FOR THE AWARD OF DEGREE OF
BACHELOR OF SCIENCE COMPUTER SCIENCE**

COSC 327: COMPILER CONSTRUCTION

STREAMS: BSC (COSC)   Y3S2   **TIME: 2 HOURS**

DAY/DATE: THURSDAY 09/04/2020   **2.30 PM – 4.30 PM**

INSTRUCTIONS:

- Answer Question **ONE** and any other **TWO** questions.
- Diagrams should be used whenever they are relevant to support an answer.
- Sketch maps and diagrams may be used whenever they help to illustrate your answer
- Do not write anything on the question paper
- This is a **closed book exam**, No reference materials are allowed in the examination room
- There will be **No** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely

SECTION A

ANSWER ALL THE QUESTIONS IN THIS SECTION

QUESTION ONE [30 MARKS]

a) Highlight the role of the symbol table in the compilation process.   [4 Marks]

b) Giving one example for each, differentiate between a low level and a high-level
   programming language.   [4 Marks]

c) Compilers and Interpreters are both used in the language translation process.

    i.   Differentiate between a compiler and an interpreter   [4 Marks]

ii.   Describe two advantages of compilers over interpreters   [2 Marks]

iii.   Describe two advantages of interpreters over compilers   [2 Marks]

d) Identify any five categories of compilers and describe each.   [5 Marks]

e) List and explain any four outputs of the preprocessor phase of compilation.   [4 Marks]

f) Name any five popular compilers and identify the language popularly associated with.
                                                                          [5 Marks]

SECTION B

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO [20 MARKS]

a) In some language processing systems, the compiler compiles to assembly language rather than to machine language. Discuss the pros and cons of this approach   [6 Marks]

b) Pass and Phases are terms used in Compiler construction

   i.   Giving examples differentiate between a pass and a phase in compiler construction
                                                                          [4 Marks]

   ii.   Identify any three type of passes in compiler design and describe each briefly
                                                                          [6 Marks]

c) Describe how a typical Java program is compiled and highlight the benefit of such an approach of compilation.   [4 Marks]

QUESTION THREE [20 MARKS]

a) Draw a diagram of a typical language processing system and explain in detail what happens at each stage of the processing through the system.   [8 Marks]

b) C++ is an example of a language that is compiled
   i.   Write a well-designed C++ program that sums up a CAT and EXAM and determines the total mark. The program then determines whether a student has passed or not given that passmark is greater or equal to 40 marks.   [6 Marks]

   ii.   By referencing the language processing system in a) above, explain how this C++ program moves from source language to target language.   [6 Marks]

QUESTION FOUR [20 MARKS]

a) Explain how lexemes becomes tokens and consequently highlight the importance of tokens in the compilation process. [4 Marks]

b) Formally define a Context Free Grammar and explore the role a Context Free Grammar plays in the compiler design. [6 Marks]

c) For any context-free grammar there is a parser that takes at most $0(n^3)$ time to parse a string of n terminals.

     i. Highlight the relationship between a Context Free Grammar and a parser [4 Marks]

     ii. Demonstrate how a CFG can be parsed in a typical compile process. [4 Marks]

     iii. Cubic time $0(n^3)$ is generally considered too expensive for a parser. Explain what can be done to reduce this time. [2 Marks]

QUESTION FIVE [20 MARKS]

a) With the aid of examples, differentiate between syntax and semantic analysis as regards compilers. [4 Marks]

b) Diagrammatically present the structure of a compiler and explain how each part works and how they work together. [16 Marks]