THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING
BACHELOR OF TECHNOLOGY
ECX6235 – COMPILER DESIGN

Date: 29 November 2017 **Time: 0930 – 1230 hrs.**

Important:
1. This question paper consists of **six** questions.
2. Answer **all** questions in **Part A** (60 marks) and any **TWO** questions from **Part B** (40 marks).
3. Clearly state your assumptions, if any.

Part A – Answer all questions

The following scenario is about a Video Store. Answers the following question.

The Video Store consists of a video and user database. The video database contains information on all video DVD titles and type (Action, Horror, etc.) currently on file, and the user database contains information on all current members of the Video Store, as well as all video DVDs currently rented by each user. User can walk into the Video Store and either rent a video DVD, or become a member of the Video Store. The use is served by the employee of the video store. Grammar rules are given as follows

1. VideoStore → VIDEOS USERS | USERS VIDEOS | VIDEOS | USERS
2. VIDEOS → VIDEOS VIDEO | VIDEO
3. VIDEO → title type RENTALS2
4. RENTALS2 → RENTALS2 RENTAL2 | RENTAL2
5. RENTAL2 → CUSTOMER1
6. CUSTOMER1 → name days
7. USERS → USERS USER | USER
8. USER → name days RENTALS
9. RENTALS → RENTALS RENTAL | RENTAL
10. RENTAL → VIDEO1
11. VIDEO1 → title type

[Q1] (a) Define the grammar (**G**) for the above scenario and Cleary show the Terminals and Non-Terminals. [05 Marks]

(b) Write LEX implementation syntax for the given grammar (**G**). [10 Marks]

[Q2] (a) Write an example string (expression), if you wish to rent two comedy DVDs for 20 days and a horror DVD for 10 days from the Video Store. [10 Marks]

(b) Validate your string using the grammar (**G**) in Q1 (a). [10 Marks]

[Q3] (a) Draw a parse tree for the string in Q2.(a). [05 Marks]

(b) Write C type declarations for an abstract syntax tree structure for the **G**. [05 Marks]

(c) Draw the abstract syntax tree for the given string Q2.(a) that would result from the C type declarations of Q3.(b). [05 Marks]

(d) Draw the NDFA and DFA for the given string Q2.(a). [10 Marks]

Part B – Answer ANY TWO questions

[Q4] Consider the following grammar rules. (*VendingMachine, STOCK, SALES, ITEM, SALE* are non-terminals and others are terminals).

VendingMachine → stock STOCK sales SALES
STOCK → STOCK ITEM | ε
ITEM → item price qty
SALES → SALES SALE | ε
SALE → item price

(a) Derive the string: ***stock item price qty sales item price*** using grammar G. [02 Marks]

(b) Define the Chomsky Normal Form (CNF) for CFGs. [04 Marks]

(c) Convert the given grammar G into CNF. [12 Marks]

(d) Derive the above string in Q4.(a) using new grammar in Q4.(c). [02 Marks]

[Q5]

(a) Briefly explain the Top down parsing and Bottom up parsing. [10 Marks]

(b) Briefly explain LALR(1) parsing using suitable examples. [10 Marks]

[Q6]

(a) Briefly explain the four types of grammars with applications. [08 Marks]

(b) Draw a diagram and briefly explain the compilation phases by giving examples for each phase. [12 Marks]