ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION   SUMMER SEMESTER, 2022-2023
DURATION: 3 HOURS   FULL MARKS: 150

CSE 4801: Compiler Design

Programmable calculators are not allowed. Do not write anything on the question paper.
Answer all **6 (six)** questions. Figures in the right margin indicate full marks of questions with
corresponding COs and POs in parentheses.

1. a) Define L-attributed definitions.   3
                                                                                                       (CO3)
                                                                                                       (PO1)

   b) Explain the evaluation process of L-attributed definitions.   12
                                                                                                       (CO3)
                                                                                                       (PO1)

   c) Draw a block diagram of an LR parser and describe different parts of it.   10
                                                                                                       (CO2)
                                                                                                       (PO1)

2. a) Discuss on two different implementation techniques for three-address statements.   11
                                                                                                       (CO5)
                                                                                                       (PO1)

   b) Design an SDD to generate three-address codes for the following statements: 7 + 7
                                                                                                       (CO5)
                                                                                                       (PO1)

   $S \rightarrow repeat\ S\ until\ E$
   $S \rightarrow while\ E\ do\ S$

3. a) Transition diagram of LR(1) items for a grammar is given in Figure 1. Construct the LALR   15
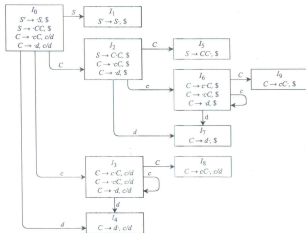   parse table for the grammar.   (CO2)
                                                                                                       (PO1)

Figure 1: LR(1) items with transition steps for a grammar.

b) Show that the grammar $S \to 0S1 \mid SS \mid \epsilon$ is ambiguous.

5
(CO2)
(PO1)

c) Explain how a *syntax tree* differs from a *parse tree*.

5
(CO2)
(PO1)

4. a) Discuss on type checking for *expressions, statements*, and *functions*.

12
(CO3)
(PO1)

b) The following grammar abstracts the dangling-else problem:

13
(CO2)
(PO2)

$S \to iEtS \mid iEtSeS \mid a$
$E \to b$

Here, i, t, and e stand for **if**, **then**, and else respectively; E and S stand for **conditional expression** and **statement** respectively. It is needed to construct a top-down predictive parser for the grammar. Rewrite the grammar to make it suitable for that purpose.

5. a) Define activation record of a function. Discuss on the contents of an activation record.

3 + 8
(CO4)
(PO1)

b) Explain how heap allocation strategy for activation record works. Discuss its advantages over other strategies.

10 + 4
(CO4)
(PO1)

6. a) Write a complete set of codes in Lex and Yacc to translate postfix expressions into infix expressions.

5 + 12
(CO3)
(PO1)

b) Explain how Lex and Yacc modules exchange data while working together.

8
(CO3)
(PO1)