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B. Sc. (Engineering) in Computer Science and Engineering
Semester Final (Online) Examination 2019(Jul-Dec)
Level **3**, Semester **II**, Course Code: **CSE 359**, Credit: **3.0**
Course Title: **Compiler Design**

Time: **1** hour **30** Minutes   Total Marks: **90**

*[N.B. The figure in the right margin indicates the marks allocated for the respective question.
The split answer of any question is not allowed.]*

Section-A

*Answer any **03(three)** from the following questions (1-4)*

1. a) Define compiler. Compare between compilation and interpretation. — 2+5
   b) Write the principles and qualities of a good compiler. — 4+4
2. a) Define the terms: prefix, suffix, and substring. — 3+4
      In a string of length *n*, how many of the following are there?
      i. Prefixes   ii. Suffixes   iii. Proper Suffixes   iv. Substrings
   b) Let $\sum = \{a,b\}$. Then explain the meaning of the following regular expressions: — 8
      i. (a|b)*   ii. (a|b) (a|b)   iii. $(a|b)^+a$ iv. a*ba*ba*
3. a) Define Context Free Grammar. When do we call grammar is ambiguous? Explain. — 3+5
   b) Construct the DAG for the input string — 7
      w + w * (x − y) + (x − y) * z using value-number method.
4. a) Determine FIRST and FOLLOW sets for the following grammar: — 5+5
      $$S \rightarrow aBd$$
      $$B \rightarrow CD$$
      $$C \rightarrow b \mid \in$$
      $$D \rightarrow c \mid \in$$
   b) Make up the predictive parsing table by following any suitable algorithm and considering the grammar in the above question 4. a). — 5

Section-B

*Answer any **03(three)** from the following questions (5-8)*

5. a) Draw the graphical representation of a computer-language processing system using a compiler. — 5
   b) Show the translation phases of a compiler for the assignment statement: — 10
      $$salary = basic + basic * forty\_percent$$
      where *salary* and *basic* are declared as ***float*** and *sixty_percent* is as ***int***.
6. a) Define token, pattern, and lexeme with example. — 7
   b) Determine the costs of the following instruction sequences: — 4+4
      i.   LD R0, b
            ADD R0, R0, c
            ST a, R0
      ii.   LD R0, c
            LD R1, i
            MUL R1, R1, 8
            BLTZ *R3, R0
7. a) Draw the transition graph and transition table for an NFA recognizing the language of regular expression $(m|n)^*mn$. — 7
   b) Show the conversion of an NFA to a DFA with a suitable example. — 8
8. Consider the following context-free grammar:
      $$G \rightarrow Expr$$
      $$Expr \rightarrow Expr\ op\ Expr \mid number \mid id$$
      $$op \rightarrow + \mid - \mid * \mid /$$
      and the string **x+5/y**
   a) Give a left-most and a right-most derivation for the string. — 5+5
   b) Draw the parse tree for the string based on one of the derivations. — 5