Total No. of printed pages = 4

CSE 181601

27/7/22

Roll No. of candidate | | | | | | | | | | |

2022

B.Tech. 6th Semester End-Term Examination

COMPILER DESIGN

(New Regulation & New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) : $(10 \times 1 = 10)$

(i) Match the following according to input to the compiler phase that processes it.

A	Syntax Tree	I	Code Generator
B	Character Stream	II	Syntax Analyzer
C	Intermediate Representation	III	Semantic Analyzer
D	Token Stream	IV	Lexical Analyzer

(a) $A \rightarrow II, B \rightarrow III, C \rightarrow IV, D \rightarrow I$ (b) $A \rightarrow II, B \rightarrow I, C \rightarrow III, D \rightarrow IV$

(c) $A \rightarrow III, B \rightarrow IV, C \rightarrow I, D \rightarrow II$ (d) $A \rightarrow I, B \rightarrow IV, C \rightarrow II, D \rightarrow III$

(ii) Which of the following is not an intermediate code form?

(a) Syntax tree (b) Three address code

(c) quadruples (d) Postfix Notation

(iii) Consider the following C program

```
int main ()
    {
    Integer X;
    return 0;
    }
```

Which of the following phases in a seven-phase C compiler will throw an error?

(a) Lexical Analyzer

(b) Machine Dependent Optimizer

(c) Semantic Analyzer

(d) Syntax Analyzer

(iv) Which of the following errors can a compiler check?

(a) Syntax Error

(b) Both Logical and Syntax Error

(c) Logical Error

(d) Compiler cannot check errors

(v) What is/are the applications of regular expression?

(a) Designing compilers

(b) Simulating sequential circuits

(c) Developing text editors

(d) All of the above

(vi) The function _____ is automatically generated by the flex when it is provided with a ./ file

(a) flex ( ) (b) yylex ( )

(c) lex ( ) (d) nnlex ( )

(vii) Consider the production of the grammar $S \rightarrow AA$ $A \rightarrow aa$ $A \rightarrow bb$ Describe the language specified by the production grammar.

(a) L = {aaaa, aabb, bbaa, bbbb}

(b) L = {abab, abaa, aaab, baaa}

(c) L = {aaab, baba, bbaa, bbbb}

(d) L = {aaaa, abab, bbaa, aaab}

(viii) The number of tokens in the following C-code statements are

```
switch (inputValue)
{
case 1 : a = b*c;
break;
default: a = a++;
break;
}
```

(a) 27 (b) 28

(c) 24 (d) 26

(ix) Consider the following grammar $S \rightarrow p \mid pq \mid pqr$

Choosing the correct statement for the grammar is _____

(a) LL(2) (b) LL(4)

(c) LL(1) (d) LL(3)

(x) Consider the augmented grammar given below:

$S' \rightarrow S$

$S \rightarrow < L > \mid id$

$L \rightarrow L, S \mid S$

Let $I_0 = CLOSURE(\{[S' \rightarrow S]\})$, the number of items in the set GOTO $(I_0, <)$ is _____

2. (a) Explain the basic task of a lexical analyzer in the analysis phase of a compiler. (7)

(b) (i) Write the rules for computing FIRST(X) and FOLLOW(A). (4+2+2=8)

(ii) Eliminate the left recursion of the grammar $E \rightarrow E + E \mid E * E \mid a \mid b$

(iii) Eliminate the ambiguity concerning the dangling else grammar.

3. (a) Discuss a Syntax-Directed Translation scheme with an example. (7)

(b) Differentiate following (4+4=8)

(i) Inherited attributes and synthesized attributes

(ii) Top down parsing and bottom up parsing

4. (a) Construct an SLR parsing table for the following grammar: (9)

$R \rightarrow R \mid R$

$R \rightarrow RR \mid R^* \mid (R) \mid a \mid b$

(b) Compare and contrast SLR with LALR. (6)

5. (a) Show the following grammar is LALR(1) (9)

$S \rightarrow Aa \mid bAc \mid dc \mid bda$

$A \rightarrow d$

(b) What do you mean by kernel and non-kernel items? Give examples. (6)

6. (a) Explain how a peephole optimization technique is locally effective to improve the target code. (9)

(b) Construct a DAG for the expression: $a + a * (b - c) + (b - c) * d$ (6)

7. (a) Generate three-address code of the following C assignment statements then Convert your three-address code into machine code. You may use as many registers as you need. $x = a/(b+c) - d*(e+f)$; (9)

(b) What is the role of the symbol table in the compilation process? Explain in brief. (6)