S.No. : 20

BCS 2604

No. of Printed Pages : 06

Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 23220 Roll No.

B. Tech. Examination 2021-22

(Even Semester)

COMPILER DESIGN

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION – A

1. Attempt all parts of the following : $8 \times 1 = 8$

   (a) What is role of code optimization in compiler?

   (b) Define the term bootstrapping.

   (c) Mention the rule of eliminate left recursion.

   (d) Short notes on evaluation order of semantics action in SDD.

   (e) Define the forms of intermediate code.

   (f) Define the role of lexical analyzer in compiler.

[P. T. O.

(g) DAG for expression (a * b) + (a * b) using mknode and mkleaf function.

(h) Write down the short notes on sub common expression elimination.

SECTION – B

2. Attempt any two parts of the following : 2×6=12

(a) Construct the syntax tree using syntax directed definition for the expression x * y – 5 + z with the help of grammar G as follows :

G :
$E \rightarrow E + T / E - T / E * T / T$
$T \rightarrow id / digit$

(b) Check whether the given grammar is CRL (1) and LALR (1) or not? Grammar G as follows :

G :
$s \rightarrow Aa$
$s \rightarrow bAc$
$s \rightarrow Bc$
$s \rightarrow bBa$
$A \rightarrow d$
$B \rightarrow d$

(c) Parse the given input string id + id * id using LL (1) parser for the given grammar G as :

G :
$E \rightarrow E + T / T$
$T \rightarrow T * F / F$
$F \rightarrow id$

(d) Describe the role of optimization techniques.

SECTION – C

Note :– Attempt all questions from this section.

$10 \times 4 = 40$

3. Attempt any two parts of the following :

(a) Generate the intermediate code for Boolean expression as follows :

$$A > B \text{ AND } B < C \text{ OR } G < H$$

with proper SDD or useful production rule of general grammar.

(b) Write down the SDD for while-do statement and generate three address code for given expression :

```
while (A < C  and  B > D) do
                {
                    if A = 1
                      then A = A + 1
                    Else B  = B + 1
                }
```

(c) Write the quadruples, triple, and indirect triple intermediate code for the following expression :

$$(x + y) * (y + z) + (x + y + z)$$

4. Attempt any two parts of the following :

(a) Calculate First and Follow function for the given grammar G as :

G :

$A \rightarrow AcB / cC / C$

$B \rightarrow bB / d$

$C \rightarrow caB / BbB / B$

(b) Construct operator precedence parser and then parse the following string (a, (a, a)). Grammar G as :

G :

$S \rightarrow (L) / a$

$L \rightarrow L, S / S$

(c) Check whether the given grammar is CLR (1) or not? Grammar G as :

$$S \rightarrow CC,\ C \rightarrow a\,C/d$$

5. Attempt any two parts of the following :

(a) Write down the differences between the synthesized and inherited attribute with suitable examples.

(b) Construct syntax tree for statement

$$x * y - 5 + z$$

given grammar G using mk leaf ( ), mknode ( ) functions :

G :

$E \rightarrow E + T / E - T / E * T$

$T \rightarrow num / id$

(c) Explain the role of optimization in compiler and define all types of loop optimization techniques used for basic blocks.

6. Attempt any two parts of the following :

(a) Explain the phases of compiler and implement all the phases for given statement :

$$x := a + b - c * 9$$

(b) Generate code for the following statement using simple code generation algorithms :

$$x = a + \frac{\left(b + \frac{c}{d * e}\right)}{(f * g)}$$

(c) Write short notes on the following :

(i) Optimization of basic blocks

(ii) Loop unrolling and loop fusion

⌘⌘⌘