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10CS63

Sixth Semester B.E. Degree Examination, June/July 2016
Compiler Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain with a neat diagram, the phases of a compiler. Mention the input and output for each phase with an example, "position = initial + rate * 60". **(12 Marks)**

b. Explain input buffering strategy used in lexical analysis phase. **(04 Marks)**

c. Construct a transition diagram for relational operators. **(04 Marks)**

2 a. Show that the following grammar is ambiguous:

$E \rightarrow E+E \mid E*E \mid (E) \mid id$

Write an unambiguous grammar for the same. **(06 Marks)**

b. Given the grammar

$S \rightarrow (L) \mid \alpha$

$L \rightarrow L,S \mid S$

i) Make necessary changes to make it suitable for LL(1) parsing.
ii) Construct FIRST and FOLLOW sets.
iii) Construct the predictive parsing table.
iv) Show the moves made by the predictive parser on the input (a, (a, a)). **(10 Marks)**

c. Write a recursive descent parser for the grammar: $S \rightarrow cAd$, $A \rightarrow ab \mid a$ and for the input "cad" trace the parser. **(04 Marks)**

3 a. Show that the following grammar is not LL(1) without constructing parsing table.

$S \rightarrow iCtSS' \mid \alpha$

$S' \rightarrow eS \mid \in$

$C \rightarrow b$ **(06 Marks)**

b. What is meant by handle pruning? Show the working of a shift reduce parser for accepting $id + id * id$, considering the grammar:

$E \rightarrow E+T \mid T$

$T \rightarrow T*F \mid F$

c. $F \rightarrow (E) \mid id$ **(10 Marks)**

For the following grammar $S \rightarrow 0S1 \mid 01$, indicate the handle in the following right sentential form 00001111. **(04 Marks)**

4 a. Consider the following grammar:

$S \rightarrow L = R \mid R$

$L \rightarrow *R \mid id$

$R \rightarrow L$

i) Obtain LR(0) items.
ii) Compute FIRST and FOLLOW.
iii) Obtain SLR parsing table.
iv) Check whether the given grammar is SLR or not. **(10 Marks)**

b. Consider the following grammar:

$S \rightarrow AA$

$A \rightarrow Aa \mid b$

i) Compute sets of LR(1) items.
ii) Construct canonical LR(1) parsing table.
iii) Show the parsing steps for the string "baaba". **(10 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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PART – B

5 a. For the given productions shown below, write semantic rules and construct annotated parse tree for $3*5+4n$

$L \rightarrow En$, $E \rightarrow E1+T$, $E \rightarrow T$, $T \rightarrow T1*F$, $T \rightarrow F$, $F \rightarrow (E)$, $F \rightarrow$digit **(08 Marks)**

b. Obtain SDD for simple type declaration. Construct a dependency graph for the declaration float a, b, c along with evaluation order. **(08 Marks)**

c. Define the following with examples:
i) S – attributed definitions
ii) L – attributed definitions. **(04 Marks)**

6 a. Explain how DAG will help in intermediate code generation. Construct a DAG and a three address-code for the expression $a+a*(b-c)+(b-c)*d$ **(08 Marks)**

b. Explain the following with an example:
i) Quadruples ii) Triples iii) Indirect triples **(06 Marks)**

c. Explain syntax directed translation of switch statement. **(06 Marks)**

7 a. Describe the general structure of an activation record. Explain the purpose of each item in the activation record. **(08 Marks)**

b. What is garbage collection? Explain the design goals of garbage collector. **(10 Marks)**

c. Define local and non-local data. **(02 Marks)**

8 a. Briefly explain various issues in code generation phase. **(10 Marks)**

b. Generate the 3-address statements for the following programming construct and obtain the basic blocks for generated code.

```
i = 1
do
    sum = sum + a[i] * b[i]
    i = i + 1
while (i <= 20)
```

(10 Marks)

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