

(CONFIDENTIAL)

BE 6th Semester Examination, 2015

Subject : Compiler Design

Paper/Code No CS 603

Branch: CST

Full Marks: 70

Answer Q. no. 1 and any four from the remaining questions.

1.

(a) Define synthesized attribute and inherited attribute associated with a grammar symbol. Show with an example the existence of an inherited attribute and a synthesized attribute for the grammar symbols present within a set of grammar rules. [3+3]

(b) What are the advantages and disadvantages associated with SLR(1), Canonical LR(1), and LALR(1) parsers. [3]

(c) Define leftmost canonical and rightmost canonical derivations. Show with an example that top-down parsing method is associated with leftmost canonical derivations whereas bottom-up parsing method is associated with reverse of rightmost canonical derivations. [2+3]

2.(a) Consider the following code fragment. Generate the three-address code for it. [2]

while $c > d$ do

{ $x = x + y$;

if $a < b$ then $a = a + b$; else $c = c + d$;

}

(b) Write the syntax directed translation schemes for the grammar rules if else, while and boolean expressions. [3 + 3 + 6]

3. (a) Given the grammar rules, compute FIRST and FOLLOW for all non-terminal symbols of the grammar consisting of the following production rules where S is the start symbol, {S,B,C,D,E,F} is the set of non-terminal symbols and {a,b,c,g,f,h} is the set of terminal symbols. [3+3]

$S \rightarrow aBDh$

$B \rightarrow cC$

$C \rightarrow bC \mid \epsilon$

$D \rightarrow EF$

$E \rightarrow g \mid \epsilon$

$F \rightarrow f \mid \epsilon$

(b) Define LL(1) grammar. [2]

(d) Construct an LL(1) parsing table for the grammar and by looking into the entries of the table state whether the grammar is LL(1) or not. [5+1]

4.(a) State the conditions to be fulfilled for common sub-expression elimination and loop optimization. [3]

(b) Explain with example how DAG can be used for common sub-expression elimination. [5]

(c) Define available expression data flow property. Which purpose is this data flow property useful for? State data flow equations for available expression data flow property.

[2+1+3]

5. (a) What are the criteria required to be satisfied for static storage allocation. [2]

(b) Define activation record. What are the different parts of activation record?

Define activation base pointer. Why is previous value of activation base pointer stored in activation record during execution of a block-structured program segment? Explain with example. [1+1 + 1 + 2+2]

(c) What is the role of display? How will display be created when a function at level j ($j > i$) will be entered from a function at level i ? [1+4]

6. (a) Define Pass. Why is design of a two-pass assembler required? What are the data structures needed for designing an assembler? Draw the flowchart for assembler design in Pass 1? How will you ensure design of a single-pass assembler? [1+1+2+4+2]

(b) What is the objective behind using MACRO in an assembly language program? Draw the flowchart for designing MACRO Assembler, defining the necessary data structures.

[1+3]

7. Given the grammar with S being the start symbol, $\{S, A, B, C\}$ being the set of non-terminal symbols and $\{\#, a, b, c, d, e\}$ being the set of terminal symbols and the rules are as follows:

0. $S \rightarrow A\#$

1. $A \rightarrow bB$

2. $B \rightarrow cC$

3. $B \rightarrow cCe$

4. $C \rightarrow dA$

5. $A \rightarrow a$

(a) Generate the sets of LR(1) items. [10]

(b) Is the grammar LR(1)? If not, why not? [4]