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10CS63

Sixth Semester B.E. Degree Examination, Dec. 2013/Jan. 2014
Complier Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the various phases of complier. Show the translations for an assignment statement. Position = initial + rate * 60, clearly indicate the output of each phase. **(12 Marks)**

b. Write the regular definition for an unsigned number. Also write the transition diagram. **(06 Marks)**

c. What is printed by the following C code?

```
# define a (x + 1)
  int x = 2 ;
  void b( ) {int x = 1; printf("%d ln", a)'}
  void c( ){printf("%d ln", a); }
  void main( ) {b( ) ; c( );}.
```

(02 Marks)

2 a. Describe an algorithm used for eliminating the left recursion. Eliminate left recursion from the grammar :

$S \rightarrow Aa \mid b \quad A \rightarrow Ac \mid Sd \mid a.$ **(06 Marks)**

b. Show that the following grammar is ambiguous :

$E \rightarrow E + E \mid E * E \mid (E) \mid id.$ Write an equivalent unambiguous grammar for the same. **(06 Marks)**

c. What are the key problems with top down parse? Write a recursive descent parser for the grammar :

$S \rightarrow cAd \quad A \rightarrow ab \mid a.$ **(08 Marks)**

3 a. Given the grammer :

$S \rightarrow aABb$

$A \rightarrow c \mid \varepsilon$

$B \rightarrow d \mid \varepsilon$

i) Compute FIRST and FOLLOW sets

ii) Construct the predictive parsing table

iii) Show the moves made by predictive parser on the input ; acdb. **(10 Marks)**

b. Explain with a neat diagram, the model of a table driven predictive parser. **(05 Marks)**

c. What is handle pruning? Give a bottom – up parse for the input : aaa * a++ and grammar :

$S \rightarrow SS + \mid SS * \mid a.$ **(05 Marks)**

4 a. Given the grammar :

$S \rightarrow CC$

$C \rightarrow cC \mid d$

i) Obtain the sets of canonical collection of sets of valid LR(0) items

ii) Design SLR parsing table. **(10 Marks)**

b. Write an algorithm used to compute LR (1) sets of items. **(06 Marks)**

c. Write a note on the parser Generator – Yacc. **(04 Marks)**

PART – B

5 a. Explain the concept of syntax – directed definition. **(05 Marks)**

b. The SDD to translate binary integer number into decimal is shown below :

Productions	Semantic rules
$BN \rightarrow L$	BN.val= L. val
$L \rightarrow L_1 B$	L. val =2 $\times L_1$.val + B. val
$L \rightarrow B$	L. val = B .val
$B \rightarrow 0$	B. val = 0
$B \rightarrow 1$	B. val = 1

Construct the parse tree and annotated parse tree for the input string : 11001. **(05 Marks)**

c. Give a SDT for desktop calculator and show its parser stack implementation. **(10 Marks)**

6 a. Translate the arithmetic expression : a + - (b + c) into quadruples, triples and indirect triples. **(06 Marks)**

b. Give a semantic action for : $S \rightarrow$ if (B) S_1 else S_2. **(06 Marks)**

c. Develop SDD to produce directed a cyclic graph for an expression. Show the steps for constructing the directed acyclic graph for the expression : a + a * (b – c) + (b – c) * d. **(08 Marks)**

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

b. A C – code to compute Fibonacci numbers recursively is shown below :

```
int f(int n)
 { int t, s ;
   if(n < = 2) return 1 ;
    s = f(n -1) ;
    t = f(n -2) ;
    return (s + t);
 }
```

i) Draw the activation tree for the call : f(5)

ii) What is the largest number of activation records that ever appear together on the stack? **(06 Marks)**

c. Explain the performance metrics to be considered while designing a garbage collector. **(06 Marks)**

8 a. Discuss the issues in the design of a code generator. **(10 Marks)**

b. Write the tree address code and construct the basic blocks for the following program segment.

```
sum = 0 ;
for(i = 0; i < = 10 ; i ++)
    sum = sum +a[i] ;
```

(05 Marks)

c. Give the code generation process for operations. **(05 Marks)**

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