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Paper Code : PCC-CS501 Compiler Design

UPID : 005506

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer *any ten* of the following : [1 x 10 = 10]

(I) If w is a string and |w| =n then the number of prefixes of w are_____.

(II) Given two DFA's M1 and M2. They are equivalent if_____.

(III) YACC is a_____.

(IV) The number of subsequences of a string w of length n are_____.

(V) _____ phase of compilation process is an optional phase.

(VI) LEX is a_____.

(VII) Constant folding means _____.

(VIII) A block kills an expression x op y iff _____.

(IX) Code generator uses _____ function to determine the status of available registers and the location of name values.

(X) The intersection of a regular language and a context free language is_____.

(XI) A left recursive grammar cannot be LL(1). (True/False)

(XII) If G=(V, T, P, S) is a context free grammar. Then L(G) will be infinite iff _____.

Group-B (Short Answer Type Question)

Answer *any three* of the following : [5 x 3 = 15]

2. Describe the language processing system with a diagram. [5]

3. Represent the following sets by regular expression: [5]
   a. {0,1,2}
   b. The set of all strings over {a,b} which consists of all words with exactly two a's
   c. The set of all strings over {a,b} which consists of all words that contain aaa or bbb as substring

4. What is a left recursive grammar? Remove left recursion from the grammar G:{S->Aa|b, A->Ac|Sd|. [5]

5. What do you mean by Syntax directed translation? Compare and contrast between S-Attributed SDT and L-attributed SDT. [5]

6. Why left recursive grammar is not suitable for predictive parsers? Remove left recursion from the grammar G:{E->E+T|T, T->TF|F, F->F* |a | b} [5]

Group-C (Long Answer Type Question)

Answer *any three* of the following : [15 x 3 = 45]

7. Consider the following augmented grammar: [5+3+4+3]
   S'->S
   S->CC
   C->c C
   C->d
   a) Construct the Set of LR(1) Items for the above grammar
   b) Construct an LALR parsing table for the same
   c) Show which states LA LR parser could be combined and why
   d) Construct the corresponding CLR parsing table

8. a) What do you mean by Peephole Optimization? [2+12+1]
   b) Explain with example (i) Constant Folding (ii) Common sub-expression elimination (iii) Loop unrolling (iv)Loop jamming
   c) What do you mean by redundant Load Store Statement?

9. Generate three address codes for [5+5+5]
   I. indexed assignments

II. pointer assignments
III. conditional statements

10. Consider the following three address code segment: [6+9]

I. prod:=0
II. i=1
*III. t1=4*i*
IV. t2=addr(A)-4
V. t3=t2[t1]
VI. t4= addr(B)-4
VII. t5:=t4[t1]
*VIII. t6:=t3*t5*
IX. prod:=prod + t6
X. i=i+1
XI. if i<=20 goto(3)

i. Find the basic blocks and flow graph of the above sequence.
ii. Optimize the code sequence by applying function preserving transformation and loop optimization techniques.

11. a) Discuss the following parameter passing techniques with suitable example: [6+4+5]

i. Call by value
ii. Call by reference
iii. Call by name

b. Discuss the following storage allocation strategies:

i. Stack allocation
ii. Heap allocation

c. Show the activation records and display just after the procedure call.

```
program main();
procedure p;
function q(a: integer) : integer;
begin
if (a=) then q:=1;
else q:= a+q(a-1);
end
begin q(3);
end;
begin p;
end;
```

*** END OF PAPER ***