

Code No: 07A51201

R07**Set No. 2****III B.Tech I Semester Examinations, November 2010****AUTOMATA AND COMPILER DESIGN****Common to Information Technology, Computer Science And Systems
Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions
All Questions carry equal marks**

1. Write a short note on following terms:

- (a) NFA
- (b) Regular expressions
- (c) Transition diagram
- (d) Token. [4+4+4+4]

2. (a) What is operator precedence grammar? What precedence relations are defined between terminals?

- (b) Distinguish between SLR & CLR parsers. [8+8]

3. (a) Write the code sequences for indexed and pointer assignments.

- (b) Discuss DAG representation of basic block. [8+8]

4. (a) Consider following pseudo program and find the result if the arguments are passed by call-by- value, call by reference & call by value result.

```

begin int a
proc p(b); int b
begin b=b+1; print(b,a) end
a = 1
p(a)
print(a)
end

```

- (b) Discuss the merits and demerits of static allocation strategy. [8+8]

5. (a) How do you handle a nonreducible flow graph. Explain with a suitable example.

- (b) Discuss loop optimization techniques. [8+8]

6. (a) What is Chomsky normal form? Explain with an example.

- (b) Prove that $L = \{0^k 1^k 2^k \mid k \text{ is any integer}\}$ is not a CFL. ($0^k 1^k 2^k$ is 0 to the power k to the power 2). [8+8]

7. Verify whether string $id+(id+id)$ is accepted by following grammar or not by using predictive parsing: $E \rightarrow TE'$

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$$E' \rightarrow +TE' / \in$$

$$T \rightarrow FT'$$

$$T' \rightarrow *FT' / \in$$

$$F \rightarrow (E)/id$$

[16]

8. (a) The following grammar defines list of literals. Write semantic rules to find type of expressions & lists.

$$P \rightarrow D; E$$

$$D \rightarrow D; D/id : T$$

$$T \rightarrow \text{list if } T/\text{char}/\text{integer}$$

$$E \rightarrow (L)/\text{literal}/\text{num}/id$$

$$L \rightarrow E, L/E$$

- (b) Write a short note bottom up evaluation of inherited attributes. [8+8]

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1. (a) Explain recursive descent parsing in detail.
 (b) State the rules to compute FIRST(X) & FOLLOW(X). [8+8]
2. (a) State & prove CFL pumping lemma.
 (b) What is Chomsky normal form? Explain with an example. [8+8]
3. Write short notes on following:
 - (a) Activation record.
 - (b) Dynamic scope.
 - (c) Call by copy restore.
 - (d) Access links. [16]
4. (a) Explain LALR parser in detail.
 (b) Give YACC specification for desk calculator. [8+8]
5. (a) Explain inherited attribute. Give examples.
 (b) Give translation scheme for case statement. [8+8]
6. (a) Generate code for following c program:


```
main()
{ int i;
  int a[10];
  while(i <= 10)
  a[i]=0;
}
```


 (b) Explain the register allocation by graph coloring. [8+8]
7. (a) Show the effect of break-statement on gen and kill sets with an example.
 (b) Discuss loop optimization techniques. [8+8]
8. (a) Describe in English the sets denoted by the following regular expressions:
 - i. $[00 + 11 + (01 + 10)(00 + 11)^*(01 + 10)^*]$
 - ii. $10+(0+11)0^*1$

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(b) Prove following identities for regular expressions r , s & t . Here $r=s$ means $L(r)=L(s)$

i. $(r^*s^*)^*=(r+s)^*$

ii. $(r+s)+t=r+(s+t)$

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R07**Set No. 1****III B.Tech I Semester Examinations, November 2010****AUTOMATA AND COMPILER DESIGN****Common to Information Technology, Computer Science And Systems
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1. (a) Define regular expression. Give examples.
(b) State & explain the properties of regular sets. [4+12]
2. Write short notes on following terms:
(a) dominators.
(b) natural loops.
(c) inner loops.
(d) preheaders. [16]
3. (a) Explain handle pruning process. Give examples.
(b) How are the shift-reduce conflicts resolved in bottom-up parsing. [8+8]
4. (a) Write the algorithm for predictive parsing.
(b) Check for LL(1) ness for following grammar:

$$\text{prog} \rightarrow \text{begin } d \text{ semi } X \text{ end}$$

$$X \rightarrow d \text{ semi } X / sY$$

$$Y \rightarrow \text{semi } s / Y / \epsilon$$
[8+8]
5. (a) Write a short note on L-attributed grammars.
(b) What is syntax tree? For the following grammar, write semantic rules to construct syntax tree:

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

$$E \rightarrow T$$

$$T \rightarrow (E)$$

$$T \rightarrow id / num$$
Write the sequence of function calls to construct syntax tree for following expression :

$$a + a * (b - c) + (b - c) * d$$
[8+8]
6. (a) Explain the register allocation by graph coloring.
(b) Generate code for the following C statements. Assume all the variables are automatic and three registers are available:
 - i. $x = a + b * c$
 - ii. $x = (a * b) + (c - (d + e))$

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iii. $x=(a/b-c)/d$. [8+8]

7. (a) Give some solutions to resolve an overloaded symbol.
(b) Give an algorithm to test the equivalence of C types. [8+8]
8. (a) Discuss lexical scoping with nested procedures and without nested procedures.
(b) Describe the method to obtain faster access to nonlocals. [8+8]

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1. (a) Write the algorithm for predictive parsing.
 (b) Explain error recovery in predictive parsing. [8+8]
2. (a) Explain error recovery in YACC.
 (b) What are the disadvantages of recursive descent parsing? [8+8]
3. (a) What is dependency graph? What is its significance?
 (b) Translate the expression $(a+b)*(c+d)+(a+b+c)$ into.
 - i. Quadruples.
 - ii. Triples.
 - iii. Indirect triples.
 - iv. Syntax tree. [8+8]
4. (a) Discuss loop optimization techniques.
 (b) What are reducible flow graphs? Explain with examples. [8+8]
5. (a) Generate code for the following C statements:
 - i. $x=f(a)+f(a)+f(a)$
 - ii. $x=f(a)/g(b,c)$
 - iii. $x=f(f(a))$
 (b) Explain the register assignment for outer loops. [8+8]
6. (a) Describe the facilities provided by languages for dynamic allocation of storage of data.
 (b) Write short notes on following:
 - i. Activation record.
 - ii. Dynamic scope.
 - iii. Call by copy restore.
 - iv. Access links. [8+8]
7. Construct FA equivalent to following regular expression:
 - (a) $(1 + 01 + 001)^*(\epsilon + 0 + 00)$
 - (b) $((0 + 1)(0 + 1))^* + ((0 + 1)(0 + 1)(0 + 1))^*$. [8+8]

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8. (a) What is type expression? Write type expressions for the following types:
- i. An array of pointers to reals, where the array index ranges from 1 to 100.
 - ii. A two dimensional array of integers whose rows are indexed from 0 to 9 and whose columns are indexed from -10 to 10.
 - iii. Functions whose domains are functions from integers to pointers to integers and whose ranges are records consisting of an integer and a character.
- (b) Prove that $L = \{0 \uparrow k \uparrow 2 \mid k \text{ is any integer}\}$ is not a CFL. ($0 \uparrow k \uparrow 2$ is 0 to the power k to the power 2). [8+8]

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