

Code No: 07A51201

R07**Set No. 2**

III B.Tech I Semester Examinations, MAY 2011
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. (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) Write a short note on type equivalence.
 (b) Write a short note on type checking. [8+8]
4. (a) Write the algorithm for operator-precedence parsing.
 (b) Check for LALR(1).
 $S \rightarrow Aa/bAc/Bc/bBa$
 $A \rightarrow d$
 $B \rightarrow d$. [6+10]
5. (a) Discuss various object code forms.
 (b) Write a C program to find whether a given number is even or not and generate code for it. [8+8]
6. (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]
7. (a) What is the role of parser in compilation process?

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(b) Check for LL(1) for following grammar:

prog \rightarrow begin d semi X end

X \rightarrow d semi X/sY

Y \rightarrow semi s Y/ ϵ

[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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R07**Set No. 4**

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Answer any FIVE Questions
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1. (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]
2. (a) Discuss lexical scoping with nested procedures and without nested procedures.
 (b) Discuss run-time storage organization for high level languages. [8+8]
3. Write short notes on following terms:
 - (a) Derivation.
 - (b) Ambiguity.
 - (c) Parse tree.
 - (d) LL(k) grammar. [16]
4. (a) Write about type checking. Consider following C declarations:


```
typedef struct
{ int a, b;
}CELL,*PCELL;
CELL foo[100];
PCELL bar(x,y)
int x;
CELL y {...}
Write type expressions for the types of foo and bar.
```
- (b) What is meant by structural equivalence? Assume the following definitions:


```
type link= ↑ cell;
var next:link;
last:link;
p: ↑ cell;
q,r: ↑ cell;
```

 Which among the following expression are structurally equivalent? Which are name equivalent?

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- i. link.
 ii. pointer(cell).
 iii. pointer(link).
 iv. pointer(record(info*integer)*(next*pointer(cell))). [8+8]
5. (a) Write a C program to find whether a given number is even or not and generate code for it.
 (b) Write a short note on code generating algorithms. [8+8]
6. (a) Give an algorithm to compute reaching definitions interprocedurally.
 (b) What is peephole? What peephole optimizations can be performed on code. [8+8]
7. (a) Consider following grammar:
 $E \rightarrow E + T/T$
 $T \rightarrow T * F/F$
 $F \rightarrow (E)/id$
 Construct SLR parsing table & find whether "id*id+id" is accepted by above grammar or not.
 (b) Compare & contrast LR & LL parsers. [12+4]
8. (a) Which of the following are regular sets?
 i. a^{n^2}
 ii. 0^{2^n}
 iii. 0^{m+n}
 iv. $a^n b^n$
 (b) List out the properties of regular sets. [8+8]

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R07**Set No. 1**

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Answer any FIVE Questions
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1. Write short notes on following:

- (a) Activation record.
- (b) Dynamic scope.
- (c) Call by copy restore.
- (d) Access links. [16]

- 2. (a) State & prove CFL pumping lemma.
- (b) What is Chomsky normal form? Explain with an example. [8+8]

- 3. (a) Discuss various object code forms.
- (b) Explain the register allocation by graph coloring. [8+8]

- 4. (a) Write an algorithm for induction variable elimination.
- (b) What are reducible flow graphs? Explain with examples. [8+8]

- 5. (a) State the rules to compute FIRST(X) & FOLLOW(X). Give examples.
- (b) Why do we need to left factor a grammar? Left factor the following grammar.
 $S \rightarrow iCtSeS/ictS$

- (c) What is the role of parser in compilation process? [8+4+4]

- 6. (a) How are the shift-reduce conflicts resolved in bottom-up parsing.
- (b) Compare CLR & LALR parsing. [8+8]

- 7. (a) Describe in English the sets denoted by the following regular expressions:
 - i. $[00 + 11 + (01 + 10)(00 + 11)^*(01 + 10)^*]$
 - ii. $10+(0+11)0^*1$
- (b) Prove following identities for regular expressions r, s & t. Here $r=s$ means $L(r)=L(s)$
 - i. $(r*s^*)^*=(r+s)^*$
 - ii. $(r+s)+t=r+(s+t)$

- 8. (a) Compare and contrast the quadruples, triples & indirect triples.

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(b) Write the translation schemes for addressing array elements for following grammar:

$$S \rightarrow L := E$$
$$E \rightarrow E + E / (E) / L$$
$$L \rightarrow Elist] id$$
$$Elist \rightarrow Elist, E$$
$$Elist \rightarrow id [E$$

[8+8]

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R07**Set No. 3**

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Answer any FIVE Questions
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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) Discuss various storage allocation strategies.
 (b) Distinguish between control link and access link. [8+8]
3. (a) Explain handle pruning process. Give examples.
 (b) How are the shift-reduce conflicts resolved in bottom-up parsing. [8+8]
4. (a) Which of the following are regular sets?
 i. a^{n^2}
 ii. 0^{2n} .
 (b) What is the significance of grouping the phases into front end & back end. [8+8]
5. (a) What is Chomsky normal form? Explain with an example.
 (b) Consider following grammar,
 $E \rightarrow E + E / E * E / literal / num / id / E mod E / E[E] / * E / float$
 Write semantic rules to compute type of expression. [8+8]
6. (a) Discuss various object code forms.
 (b) Write a short note on code generating algorithms. [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) Consider following grammar:
 $S \rightarrow L.L$
 $L \rightarrow LB$
 $L \rightarrow B$
 $B \rightarrow 0/1$
 It derives all floating binary numbers. Write the semantic rules for the floating binary number which is converted into a floating decimal number.
 (b) Translate the expression $(a+b)*(c+d)+(a+b+c)$ into:
 i. Quadruples.

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- ii. Triples.
- iii. Indirect triples.
- iv. Syntax tree.

[8+8]

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