

Printed Pages : 2

Roll No.

Questions : 7

Sub. Code :

6	8	6	3
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Exam. Code :

9	2	5
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B.Engg. (Information Technology) 7th Semester

1125

COMPILER DESIGN

Paper-IT-733

Time Allowed : Three Hours]

[Maximum Marks : 50

Note :— First question is compulsory. Attempt at least **two** questions each from Section A and Section B. All questions carry equal marks.

- I. (a) What are the various principle sources of code optimization ? 2
- (b) What do you mean by intermediate code ? What are the advantages of generating it ? 2
- (c) Differentiate between synthesized and inherited attributes. 2
- (d) Define handle. What are the issues involved in handle pruning ? 2
- (e) What do you mean by peephole optimization ? 2

SECTION-A

- II. (a) What do you mean by phase of a compiler ? Why the process of compilation is divided into various phases ?
- (b) Differentiate between token, lexeme and pattern. 5,5

6863/BHJ-32746

[Turn over

- b) $y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252x(n-2)$
Explain the architecture of ADSP 21XX family of process

- Q.6a) What are the two main methods of IIR filter design? Also

III. Construct the LALR parsing table for the following grammar

$$E \rightarrow E + T \mid T$$

$$T \rightarrow TF \mid F$$

$$F \rightarrow F^* \mid a \mid b.$$

10

IV. What are predictive parsers? Write down the rules to construct the predictive parsing table. Consider the grammar:

$$S \rightarrow +SS \mid *SS \mid a$$

Is the grammar LL(1)? If yes, construct the predictive parsing table.

Parse the string $+*aaa$.

10

SECTION-B

V. Let the synthesized attribute $F.val$ give the value of the binary fraction generated by F in the grammar that follows:

$$F \rightarrow .L$$

$$L \rightarrow LB \mid B$$

$$B \rightarrow 0 \mid 1$$

Using only synthesized attributes, give a translation scheme for the given grammar. Show translation of the input string $.101$ by decorating the parse tree.

10

VI. Describe in detail the common forms of intermediate code representation. Using each representation, represent the expression $a^* - (b + c)$.

10

VII. Write short notes on:

(a) Flow graphs

(b) Storage allocation strategies.

5,5

July-2016

Exam Code: 0925
Sub. Code: 68631076
B.E. (Information Technology) Seventh Semester
IT-733: Compiler Design

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. VII (Unit-III) which is compulsory and selecting two questions each from Unit I - II.

X-X-X

UNIT - I

- I.
 - a) List the errors generated by the syntax analysis phase of a compiler. Discuss error handling methods in the syntax analysis phase.
 - b) How top down and bottom up parser will parse the string 'bbd' using grammar $A \rightarrow bA \mid d$. Show all steps clearly. (5,5)
- II.
 - a) Define an Operator Precedence Grammar. Also write down the rules to find relationship between each pair of terminal symbols.
 - b) Show that the following grammar is LR(1) but not LALR(1).

$$S \rightarrow Aa \mid bAc \mid Bc \mid bBa$$

$$A \rightarrow d$$

$$B \rightarrow d$$
 (5,5)
- III.
 - a) Explain lexical analysis phase of a compiler and, for a statement given below, write output of all phases (except of an optimization phase) of a compiler. Assume a, b and c of type float.

$$a = a + b * c * 2;$$
 - b) Draw Deterministic Finite Automata (DFA) for the following regular expressions:
 - i) $(0+1)^* 101(0+1)^*$
 - ii) $10(0+1)^*1$ (5,5)

UNIT - III

- IV.
 - a) Discuss synthesized and inherited attributes using a suitable grammar.
 - b) What is intermediate code? What is its importance? Discuss various representations of three address code. (5,5)
- V.
 - a) How is static memory allocation scheme different from stack-based allocation scheme? Explain.
 - b) Explain how value parameters and reference parameters are treated during code generation. What effects does this have on the code generation process? (5,5)

P.T.O.

Exam.Code:0925

Sub. Code: 6865

1128

B.E. (Information Technology)

Seventh Semester

ITE-746: Compiler Design

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

- What is Translator? Differentiate between Compiler and Interpreter.
- Differentiate between DFA and NFA.
- Write the need of Semantic analysis
- Compare local optimization with global optimization
- What is an LL(1) grammar? When the grammar is said to be LL(1) grammar? (5x2)

UNIT - I

- What is ambiguity? How an ambiguous Grammar can be converted to unambiguous Grammar.
 - Explain how LEX tool helps in performing the operation of Lexical Analysis. (5,5)
- Consider the following Grammar. Find LEADING and TRAILING for the following Grammar.
 $S \rightarrow E + T \mid T \quad T \rightarrow T \times F \mid F \quad F \rightarrow (F) \mid a \mid b$
 - Analyze the working of Compiler with the help of following statement.
 $Z = A + B + C \times 10$ (5,5)
- Design NFA for the Regular Expression
 $(a+b)^* a (a+b)$
 - Discuss Recursive Descent Parsing. (5,5)

UNIT - II

- Write Three Address code. Quadruple and Triples for the following expression:
 $(a + b) \times (c - d \times e)$
 - Construct the DAG for the following expression $(axb) + (c-d) \times (axb) + b$. (5,5)

P.T.O.

(2)

- VI. a) What is Code Optimization? Explain the difference between Local and Loop Optimization. (5,5)
- b) What is Symbol Table? Explain the use of Hash Table in Symbol Table. (5,5)
- VII. a) What is Peephole optimization? Explain its characteristics. (5,5)
- b) Write the different Storage Allocation Strategies.

x-x-x

1127
B.E. (Information Technology)
Seventh Semester
ITE-746: Compiler Design
(2015-16)

Time allowed: 3 Hours

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

Max. Marks: 50

x-x-x

- 1)
- Which phase (or phases) of a compiler perform(s) constant folding and loop unrolling?
 - Which phase (or phases) of a compiler is/are independent of the underlying machine?
 - What is YACC?
 - What is loop jamming?
 - What is basic block in compiler design?
- (5x2=10)

UNIT-I

- 2)
- Diagram the likely components of a compiler and describe what each component does in the compiler.
 - Discuss in brief about the actions performed by a simple code generator while generating code for a typical three-address statement of a form $x := y \text{ op } z$.
- (5, 5)
- 3)
- What is lexical analysis? How are tokens specified and recognized in lexical analysis phase?
 - Regular expression $(aa^*)|(bb^*)$ is given. Construct NFA for the expression and convert this NFA to DFA.
- (5, 5)
- 4)
- What is the role of a parser? How parsing techniques are classified?
 - Construct LALR parsing table for the following grammar:

$S \rightarrow S$

$S \rightarrow aAd | bBd | aBc | bAc$

(5, 5)

UNIT-II

- 5) What is run time memory management? How is static memory allocation scheme different from stack-based allocation scheme? Discuss and analyze about all the allocation strategies in run-time storage environment. (10)
- 6) What are the main operations for a symbol table? Discuss the data structures associated with a symbol table maintained as a list of hash tables and how the operations of a symbol table are implemented in that case. Give an example of what your symbol table would look like for a sample program. (10)
- 7)
- What is the difference between synthesized and inherited attributes in attribute grammars? Give an example for each.
 - Discuss any THREE popular code optimization techniques. Explain with appropriate examples for each of these techniques. (5, 5)

x-x-x

B. Engg. (Computer Science and Engineering)-6th Semester
CS-604: Compiler Design

Exam. Code: 0918
Sub. Code: 6795

Time allowed: 3 Hours

Max. Marks: 50

Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.

Section - A

1.	<p>a) What is the difference between compiler and assembler.</p> <p>b) Explain use of lex with a simple example.</p> <p>c) What are various types of intermediate code representation schemes?</p> <p>d) Differentiate between top down and bottom up parsers.</p> <p>e) Consider the following context-free grammar over the alphabet $\Sigma = \{a, b, c\}$ with S as the start symbol: $S \rightarrow abScT \mid abcT \quad T \rightarrow bT \mid b$ Write the language generated by above grammar.</p>	5*2
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Section B

2.	Define compiler and explain phases of a compiler with a neat diagram.	5
	(ii) Construct a transition diagram for recognizing unsigned numbers.	5
3.	<p>Given the grammar $S \rightarrow (L) \mid a \quad L \rightarrow L, S \mid S$</p> <p>-Make required changes to make it suitable for LL(1) parsing.</p> <p>-Construct FIRST and FOLLOW sets</p> <p>-Construct the predictive parsing table</p> <p>-Show the moves made by the predictive parser on the input(a, (a,a))</p>	10
4.	<p>Construct a SLR parsing table for the grammar given below.</p> <p>$E \rightarrow E+T,$ $E \rightarrow T,$ $T \rightarrow T * F$ $T \rightarrow F,$ $F \rightarrow id$ $F \rightarrow (E)$</p>	10

Section C

5.	Explain following with code optimization:	5
	(i) Finding local common sub-expression (ii) Dead code elimination (iii) Loop unrolling (iv) Peep Hole Optimization	5
	(b) Discuss following terms: i) Basic Block (ii) flow graph (iii) DAG (iv) Three Address code	5
6.	<p>a) For a given grammar</p> <p>$E \rightarrow E+T \mid T \mid E-T$ $T \rightarrow (E) \mid id \mid num$ Write an SDT to generate syntax tree for expression : $a-4+c$</p>	7
	b) Compare synthesized and inherited attributes.	3
7.	<p>Write a short note on</p> <p>(a) storage allocation strategies</p> <p>(b) A simple code generator algorithm</p>	10

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Roll No.

Questions : 7

Sub. Code :

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Exam. Code :

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B.Engg. (Computer Science & Engg.) 7th Semester
1125

COMPILER DESIGN

Paper-CSE-711

Time Allowed : Three Hours]

[Maximum Marks : 50

Note :— Attempt **five** questions in all. Selecting **two** questions from Sections A & B.

1. (a) Draw DFA with minimum number of after accepting $(a + b)^* abb$ over Σ containing $\{a, b\}$.
 - (b) Differentiate SLR from CLR.
 - (c) Give the detailed process of register allocation in code generation.
 - (d) What is panic mode recovery ? Where it is used ?
 - (e) Which is more powerful CFG or regular expression and why ?
- 2×5

SECTION-A

2. Construct Predictive parsing table for the grammar :

$E \rightarrow TE'$ $E' \rightarrow + TE' / \epsilon$ $T \rightarrow FT'$

$T' \rightarrow *FT' / \epsilon$ $F \rightarrow (E) / id$

10

6821/BHJ-32829

[Turn over

b) Give some major code optimization

- VII. a) Explain any code generation algorithm with example.
- b) Define basic blocks, flow graphs and then explain how optimization.

- Time Allowed: 30 minutes. Question No. 1 is compulsory. Section A and any 2 questions from Section B. Total Marks: 30. Pages: 3. Questions: 7.
3. (a) Construct Operator Precedence parsing table for the grammar:
- $$S \rightarrow a \mid \wedge (R)$$
- $$T \rightarrow S, T \mid S$$
- $$R \rightarrow T$$
- (b) Give an overview of the lexical analyser. 3
4. Construct the SLR parsing table and then a DFA corresponding to the grammar:
- $$S \rightarrow L = R \mid R$$
- $$L \rightarrow *R \mid id$$
- $$R \rightarrow L.$$
- 10

SECTION-B

5. (a) Explain the concept of Syntax Directed Translation with examples.
- (b) Differentiate Synthesized attributes from inherited attributes.
- (c) Give Syntax Directed Translation for Calculator.
- (d) Draw annotated parse tree for $4 * 5 + 7n$. 2.5×4
6. What are main issues in code generation? For the following code segment generate intermediate code and identify the basic blocks:
- ```

For i = 1 to 10 do
 For j = 1 to 10 do
 a[i, j] = 0.0
 For i = 1 to 10 do
 a[i, i] = 1.0

```
- 10
7. (a) Draw the DAG for  $a + a * (b - c) + (b - c) * d$ . Show all steps. 5
- (b) What is an activation record? Explain function of each item in activation record. 5

Exam. Code: 919

Sub. Code: 6820

1124

B. E./B.E. MBA (Computer Science & Engineering)

7<sup>th</sup> Semester

CSE-711: Compiler Design

Time Allowed: 3 hours

Max. Marks: 50

*Note: Attempt five questions in all, including Question No. 1 which is compulsory and selecting at least two questions from each Unit I and II.*

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- I. a) Differentiate code optimization from code generation.  
b) Which is more powerful and why: Regular expression and context free grammar.  
c) Differentiate YACC from LEX by mentioning their functionality.  
d) Explain by giving example of inherited attributes.  
e) Explain peephole optimization process. (5x2)

**UNIT-I**

- II. Differentiate recursive decent parser from predictive parser. Explain by giving all algorithms used and by tracing with an example the construction of predictive parsing table. (10)
- III. Differentiate SLR, CLR and LALR. Then explain the construction of CLR parsing table by giving all the algorithms used and then by taking an example. (10)
- IV. a) Explain with example the construction of operator precedence parsing table.  
b) Give some error recovery techniques for predictive parsers, LR parsers and operator precedences parsers. (5,5)

**UNIT-II**

- V. a) Give some storage allocation strategies used by compiler.  
b) Compare some data structure available for storing symbol table. (5,5)
- VI. a) Explain with example –Intermediate code representation techniques.  
b) Give some major code optimization constructs. (5,5)
- VII. a) Explain any code generation algorithm with example.  
b) Define basic blocks, flow graphs and then explain how they can be used in code optimization. (4,6)

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(6820)



July-2016

Exam. Code: 919

Sub. Code: 6821

1076

B.E.(Computer Science and Engineering) 7<sup>th</sup> Semester  
CSE-711: Compiler Design

Time Allowed: 3 hours

Max. Marks: 50

Note: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit I - II.

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- I. a) What is the need of generating intermediate code?  
b) Differentiate LEX from YACC.  
c) Differentiate parse tree from syntax tree.  
d) What do you understand by binding of names?  
e) Differentiate between LEADING ( ) and FIRST ( ).  
f) Give some applications of DAG.  
g) What is loop jamming?  
h) Name any two Bottom-up parser.  
i) What is panic mode recovery?  
j) What do you mean by Register allocation in compilation? (10x1)

UNIT-I

- II. a) Which one is more powerful: Regular expression or finite automata? Explain with examples.  
b) Giving algorithms for finding LEADING and TRAILING. (5,5)
- III. Give the complete process of generating Predictive parsing table by giving all the algorithms used. Also trace the same for generating parsing table for any assumed grammar. (10)
- IV. Give the complete procedure to generate the CLR parsing table by detailing all the algorithms used. Also trace the same for generating the parsing table for some assumed grammar. (10)

UNIT-II

- V. a) Differentiate synthesized attributes from inherited attributes by giving examples.  
b) Give some intermediate code representation techniques with examples. (5,5)
- VI. a) What is a flow graph? Give the procedure to draw a flow graph along with some examples and its applications.  
b) Give in detail any of the code generation algorithm. Also give examples to explain the same. (5,5)
- VII. a) Explain Peephole optimization in detail.  
b) Give some principle sources of optimization.  
c) Explain any three storage allocation strategies.  
d) Give any three symbol table storage data structures. (4x2½)

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(6821)