

Enrollment No.....



Faculty of Engineering  
End Sem Examination May-2024  
IT3CO37 Compiler Design

Programme: B.Tech.

Branch/Specialisation: IT

**Duration: 3 Hrs.****Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. Cross compiler is used for: 1
- (a) Converting source code into machine code for the same architecture
  - (b) Converting source code into machine code for a different architecture
  - (c) Converting machine code into source code
  - (d) Debugging programs
- ii. Input buffering in lexical analysis refers to: 1
- (a) Storing the entire source code in memory
  - (b) Dividing the source code into tokens
  - (c) Reading characters from the input source one at a time
  - (d) None of these
- iii. Bottom-up parsers are also known as: 1
- (a) Top-down parsers                      (b) Left-to-right parsers
  - (c) Shift-reduce parsers                  (d) Recursive descent parsers
- iv. What does LALR stand for in LALR parsing? 1
- (a) Lookahead-LR
  - (b) Leftmost-Rightmost
  - (c) Lookahead-LALR
  - (d) Left-to-Right, Rightmost derivation
- v. What is the primary purpose of Syntax Directed Translation (SDT)? 1
- (a) To check the syntax of a programming language
  - (b) To translate high-level source code into machine code
  - (c) To associate semantic actions with the productions of a grammar
  - (d) To optimize the code generated by the compiler

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- vi. In the context of syntax-directed translation, what is the purpose of a dependency graph? **1**  
 (a) To represent the hierarchical structure of syntax trees  
 (b) To visualize the dependencies between attributes in a grammar  
 (c) To determine the precedence of operators in an expression  
 (d) To depict the flow of control in a translation scheme
- vii. Triples in intermediate code generation are often used for: **1**  
 (a) Symbol table management (b) Control flow analysis  
 (c) Loop optimization (d) Reducing redundancy in the code
- viii. Which of the following is typically stored in an activation record? **1**  
 (a) Program instructions (b) Local variables  
 (c) Global variables (d) Compiler directives
- ix. What is a basic block in the context of code optimization? **1**  
 (a) A block of code that does not contain any control flow statements  
 (b) A block of code with a single-entry point and a single exit point  
 (c) A block of code with multiple entry points and a single exit point  
 (d) A block of code with multiple entry points and multiple exit points
- x. Which of the following is a typical optimization performed during loop invariant computations? **1**  
 (a) Moving loop-invariant computations outside the loop  
 (b) Moving loop-varying computations inside the loop  
 (c) Converting loops into conditional statements  
 (d) Eliminating loops from the code entirely
- Q.2 i. Describe the role of lexical analyzer and also explain the concept of input buffering. **4**  
 ii. Explain different phases of compiler with example in detail. **6**  
 OR iii. Explain cross compiler and bootstrap compiler with suitable diagram. **6**
- Q.3 i. Explain left recursion and left factoring with example. **4**  
 ii. Verify whether the following grammar is LL (1) or not? **6**  
 $E \rightarrow E + T \mid T$   
 $T \rightarrow T * F \mid F$   
 $F \rightarrow (F) \mid a \mid b$
- OR iii. Construct the collection of LR (0) item sets and draw the goto graph for the grammar  $S \rightarrow S S \mid a \mid \epsilon$ . Indicate the conflicts (if any) in the various states of the SLR parser **6**

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- Q.4 i. Write difference between L-attribute definition and S-attribute definition. **4**  
 ii. What is the function of semantic analysis? How it will work and what will be the output? **6**  
 OR iii. Construct the syntax tree for the expression  $x*y-5+7$  using mknnode, mkleaf functions. **6**
- Q.5 Attempt any two:  
 i. Explain various storage allocation strategies with their advantages and disadvantages. **5**  
 ii. Explain various parameter passing techniques which are used by compiler, with example. **5**  
 iii. Write the three-address code for the following expression and represent in quadruple, triple, indirect triple. **5**  
 $\text{for}(i = 1; i \leq 10; i++)$   
 $\{$   
 $\quad a[i] = x * 5;$   
 $\}$
- Q.6 Attempt any two:  
 i. Define basic blocks with example and explain their significance in code optimization. **5**  
 ii. Define directed acyclic graph and its use. Also draw the DAG for the expression- **5**  
 $(a*b) + (c-d) * (a*b) + b.$   
 iii. Discuss various methods for loop optimization with example. **5**

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## Marking Scheme

### COMPILER DESIGN (CD) IT3CO37

Q.1	i)	b) Converting source code into machine code for a different architecture	1
	ii)	c) Reading characters from the input source one at a time	1
	iii)	c) Shift-reduce parsers	1
	iv)	a) Lookahead-LR	1
	v)	c) To associate semantic actions with the productions of a grammar	1
	vi)	b) To visualize the dependencies between attributes in a grammar	1
	vii)	d) Reducing redundancy in the code	1
	viii)	b) Local variables	1
	ix)	b) A block of code with a single-entry point and a single exit point	1
	x)	a) Moving loop-invariant computations outside the loop	1
Q.2	i.	role of Lexical Analyzer input buffering.	2 Marks 2 Marks
	ii.	phases of compiler with example in detail	1 Mark of each phase
	OR iii.	Cross compiler bootstrap compiler	3 Marks 3 Marks
Q.3	i.	Left Recursion and Left Factoring	2 Marks each
	ii.	Verify whether the following grammar is LL (1) or not? $E \rightarrow E + T \mid T$ $T \rightarrow T * F \mid F$ $F \rightarrow (F) \mid a \mid b$	6 6 Marks
	OR iii.	Complete solution	6 Marks
Q.4	i.	difference	1 Mark each
	ii.	function of semantic analysis How it will work what will be the output.	3 Marks 2 Marks 1 Marks
	OR iii.	syntax tree	6 Marks
Q.5	i.	allocation strategies Advantage & disadvantages	3 Marks 2 marks
	ii.	parameter passing techniques	5 Marks
	OR iv.	three-address code representation	2 Marks 1 Mark each

Q.6	Attempt any two questions:		
	i.	basic blocks with example significance in code optimization	3 Marks 2 Marks
	ii.	Directed Acyclic Graph use DAG for the expression (a*b) + (c-d) * (a*b) + b.	1 Marks 2 Marks 2 Marks
	iii.	various methods for loop optimization with example	5 Marks
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