Q.5	i.	Discuss static vs. dynamic memory allocation.	**4**	01	01	01	01,02, 03,04
	ii.	Write quadruple, triples and indirect triples for following expression: (x + y) * (y + z) + (x + y + z)	**6**	03	03	03	01,02, 03,04
OR	iii.	Explain how scope is managed in a symbol table. What are the implications of different scope types?	**6**	03	01	03	01,02, 03,04
Q.6		Write short note on any two:					
	i.	Local optimization and global optimization.	**5**	01	01	01	01,02, 03,04
	ii.	The process and benefits of loop unrolling in loop optimization	**5**	02	01	02	01,02, 03,04
	iii.	Control-Flow and Data-Flow Dependence	**5**	01	02	01	01,02, 03,04

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec 2024
CB3CO10 Compiler Design

Programme: B.Tech. Branch/Specialisation: CSBS

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.

			Marks	**BL**	**PO**	**CO**	**PSO**
Q.1	i.	During which phase of compilation are parse trees created? (a) Lexical analysis (b) Syntax analysis (c) Semantic analysis (d) Code generation	**1**	01	01	01	01,02, 03,04
	ii.	In Lex, the rule section of a specification file contains: (a) Tokens and their associated actions (b) Keywords and their memory locations (c) A list of regular expressions and their grammar rules (d) Syntax rules and parse trees	**1**	01	01	01	01,02, 03,04
	iii.	If a production is of the form A → αBβ, the terminal symbols in the First(β) will be included in: (a) First(A) (b) Follow(A) (c) Follow(B) (d) None of these	**1**	01	03	01	01,02, 03,04
	iv.	Which of the following components are present in a push-down automaton? (a) Input tape, finite control, and a stack (b) Input tape, finite control, and two stacks (c) Input tape, infinite control, and a queue (d) Input tape, Turing machine, and a stack	**1**	01	01	01	01,02, 03,04

v.	Which of the following parsers uses the smallest number of states for most practical programming languages? (a) LR(1) (b) LALR(1) (c) LR(0) (d) SLR(1)	**1**	01	02	01	01,02, 03,04
vi.	In syntax-directed definitions, what type of attribute can be passed from parent to child nodes? (a) Synthesized attribute (b) Inherited attribute (c) Local attribute (d) Context-free attribute	**1**	01	02	01	01,02, 03,04
vii.	What does the scope of a symbol refer to in a symbol table? (a) The value assigned to the symbol (b) The type of the symbol (c) The region of the program where the symbol is valid (d) The memory address of the symbol	**1**	01	03	01	01,02, 03,04
viii.	What is the main purpose of a stack in run-time memory management? (a) To manage function calls, return addresses, and local variables (b) To manage dynamic memory allocation (c) To store global variables (d) To optimize code execution	**1**	01	01	01	01,02, 03,04
ix.	Which of the following is a local optimization technique? (a) Loop unrolling (b) Dead code elimination (c) Common subexpression elimination (d) Code motion	**1**	01	01	01	01,02, 03,04
x.	Which optimization technique is aimed at reducing the number of instructions in loops? (a) Function inlining (b) Loop unrolling (c) Code hoisting (d) Peep-hole optimization	**1**	01	02	01	01,02, 03,04

Q.2	i.	What defines a regular language? Provide an example.	**2**	01	01	01	01,02, 03,04
	ii.	Describe the structure of a token in lexical analysis.	**3**	01	02	01	01,02, 03,04
	iii.	How do the various phases of a compiler work together to convert source code into machine code? Include a diagram.	**5**	01	01	01	01,02, 03,04
OR	iv.	What is the difference between the front-end and back-end of a compiler?	**5**	02	01	02	01,02, 03,04
Q.3	i.	What are operator grammars? Provide an example.	**2**	01	01	01	01,02, 03,04
	ii.	Consider the following CFG: $E \rightarrow E + T \mid T$ $T \rightarrow T * F \mid F$ $F \rightarrow (E) \mid id$ Describe the procedure to create the First and Follow sets for the non-terminals E, T, and F, step by step.	**8**	03	03	03	01,02, 03,04
OR	iii.	Using the grammar below, create the LL(1) parsing table and check whether grammar is accepted using LL(1) Parser or not. $E \rightarrow E + T \mid T$ $T \rightarrow T * F \mid F$ $F \rightarrow x \mid y \mid z$	**8**	03	03	03	01,02, 03,04
Q.4	i.	Explain the different types of LR parsers: SLR(1), LR(1), and LALR(1).	**3**	01	03	01	01,02, 03,04
	ii.	Consider the grammar: $S \rightarrow A\ B$ $A \rightarrow a\ A \mid b$ $B \rightarrow c \mid \varepsilon$ Construct the SLR(1) parsing table. Identify any conflicts.	**7**	02	03	02	01,02, 03,04
OR	iii.	Define Syntax-Directed Definitions (SDDs) and discuss the different types of SDDs, providing examples for each type. In your answer, explain the significance of SDDs in compiler design.	**7**	01	01	01	01,02, 03,04

Marking Scheme
CB3CO10 Compiler Design

Q.1	i)	b) Syntax analysis	**1**
	ii)	a) Tokens and their associated actions.	**1**
	iii)	c) Follow(B)	**1**
	iv)	a) Input tape, finite control, and a stack	**1**
	v)	b) LALR(1)	**1**
	vi)	b) Inherited attribute	**1**
	vii)	c) The region of the program where the symbol is valid.	**1**
	viii)	a) To manage function calls, return addresses, and local variables.	**1**
	ix)	c) Common subexpression elimination	**1**
	x)	b) Loop unrolling	**1**

Q.2	i.	Defination of Regular language 1 marks Example 1 marks		**2**
	ii.	Structure of Tokens 2 marks Example 1 marks		**3**
	iii.	Various Phases Explanation 3 marks Example 1 marks Diagram 1 marks		**5**
OR	iv.	Front end definition 2 marks Diagram of front end 0.5 marks Back end definition 2 marks Diagram of back end 0.5 marks		**5**
Q.3	i.	Operator grammars definition 1 marks Example 1 marks		**2**
	ii.	Complete step by step Solution of First() 4 marks Complete step by step Solution of Follow() 4 marks		**8**
OR	iii.	First() and Follow() of given Grammar 2 marks LL(1) Parsing Table with steps 4 marks Accepted or Rejected Result with explanation 2 marks		**8**
Q.4	i.	SLR(1) 1 marks LR(1) 1 marks and LALR(1) 1 marks		**3**
	ii.	First() and Follow () of given grammar 2 marks SLR(1) Parsing table 4 marks Check conflict 1 marks		**7**
OR	iii.	Define Syntax-Directed Definitions (SDDs) 2 marks Types of SDDs 3 marks Significance of SDDs 2 marks		**7**
Q.5	i.	Static vs. dynamic memory allocation 4 marks Minimum Four differences		**4**
	ii.	Solution of quadruple 2 marks Solution of triples and 2 marks Solution of indirect triples 2 marks		**6**
OR	iii.	Define Scope 2 marks How scope is managed in a symbol table 2 marks Implications of different scope types? 2 marks		**6**
Q.6				
	i.	Local optimization(definition and example) 2.5 marks global optimization (definition and example) 2.5 marks		**5**
	ii.	The process loop unrolling 2.5 marks benefits of loop unrolling 2.5 marks		**5**
	iii.	Control-Flow 2.5 marks Data-Flow Dependence 2.5 marks		**5**

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P.T.O.