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**BTECH**  
**(SEM V) THEORY EXAMINATION 2023-24**  
**COMPILER DESIGN**

TIME: 3 HRS

M.MARKS: 100

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt all questions in brief.**

**2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Define bootstrapping in the context of compilers.	2	1
b.	Which phase of compiler is optional and why?	2	1
c.	Explain the concept of shift-reduce parsing.	2	2
d.	Differentiate Parse tree and Syntax tree with an example.	2	2
e.	Define syntax-directed translation schemes.	2	3
f.	What are the two types of attributes that are associated with a grammar symbol?	2	3
g.	Discuss how scope information is represented in a symbol table.	2	4
h.	What is mean by Activation record?	2	4
i.	Discuss two design issues in code generation.	2	5
j.	Explain the concept of global data-flow analysis.	2	5

**SECTION B**

**2. Attempt any three of the following:**

**10x3=30**

a.	Describe the relationship between finite state machines and regular expressions. Discuss how regular expressions are used in lexical analysis and pattern matching.	10	1
b.	For the grammar $S \rightarrow aAd \mid bBd \mid aBe \mid bAe$ , $A \rightarrow f$ , $B \rightarrow f$ Construct LR(1) Parsing table. Also draw the LALR table.	10	2
c.	Explain the concepts of quadruples and triples in the context of syntax-directed translation. Discuss how they represent intermediate code and support optimization.	10	3
d.	Describe a simple stack allocation scheme for managing memory during program execution. Explain how it is used for storing local variables and managing function calls.	10	4
e.	Explain the role of a code generator in a compiler. Discuss its responsibilities and how it translates intermediate code into the target code.	10	5

**SECTION C**

**3. Attempt any one part of the following:**

**10x1=10**

a.	Given a regular expression $a(b c)^*$ , construct the corresponding Nondeterministic Finite Automaton (NFA) that recognizes the language described by the regular expression.	10	1
b.	Check whether given grammar is ambiguous or not. If ambiguous then convert it into unambiguous grammar: $E \rightarrow E+E \mid E^*E \mid id$ .	10	1



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**4. Attempt any one part of the following: 10x1=10**

a.	Check whether the given grammar is LR(0) or not: $S \rightarrow PQy$ , $P \rightarrow Sy x$ , $Q \rightarrow yS$ .	10	2
b.	Consider the following grammar for a simple expression language: $E \rightarrow E + T \mid T$ $T \rightarrow T * F \mid F$ $F \rightarrow ( E ) \mid id$ Consider expression $id * (id+id)$ . Apply shift reduce parsing to construct parse tree.	10	2

**5. Attempt any one part of the following: 10x1=10**

a.	Write syntax directed definition for a given assignment statement: $S \rightarrow id=E$ $E \rightarrow E+E$ $E \rightarrow E * E$ $E \rightarrow -E$ $E \rightarrow (E)$ $E \rightarrow id$	10	3
b.	Explain how syntax-directed translation handles array references within arithmetic expressions.	10	3

**6. Attempt any one part of the following: 10x1=10**

a.	Define Symbol table? Explain about the data structures used for symbol table.	10	4
b.	Define semantic errors in a compiler. Discuss the challenges associated with detecting and handling semantic errors. Provide examples to illustrate semantic issues.	10	

**7. Attempt any one part of the following: 10x1=10**

a.	Consider a basic block with the following three instructions: 1. $x = a + b$ 2. $y = x * c$ 3. $z = y - d$ Apply common sub expression elimination to optimize the basic block.	10	5
b.	Construct a Directed Acyclic Graph (DAG) to represent the following basic block: 1. $x = a + b$ 2. $y = c - d$ 3. $z = x * y$	10	5