Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2023

CS3CO27 Compiler Design

Programme: B.Tech. Branch/Specialisation: CSE / All

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. 'Turbo C' is which type of compilers: **1**

(a) Native Compilers (b) Two Pass Compilers

(c) Both (a) and (b) (d) None of these

ii. In compiler lexical analyzer is used for- **1**

(a) Removing comments

(b) Removing whitespace

(c) Breaking the syntaxes in the set of tokens

(d) All of these

iii. Parsing is categorized into how many types? **1**

(a) Three types (b) Four types

(c) Two types (d) Five types

iv. Which of the following parser is a top-down parser? **1**

(a) LALR parser

(b) LR parser

(c) Operator precedence parser

(d) Recursive descent parser

v. 'Shift reduce parsers are _____. **1**

(a) Top-Down Parser

(b) Bottom-Up parser

(c) May be top down or bottom up

(d) None of these

P.T.O.

vi. What is the similarity between LR, LALR and SLR? **1**
(a) Use same algorithm, but different parsing table.
(b) Same parsing table, but different algorithm
(c) Their Parsing tables and algorithm are similar but uses top down approach.
(d) Both Parsing tables and algorithm are different

vii. In a bottom up evaluation of a syntax direction definition, inherited attributes can _____. **1**
(a) Always be evaluated.
(b) Be evaluated only if the definition is L –attributed.
(c) Evaluation only done if the definition has synthesized attributes.
(d) None of these

viii. Syntax Directed Translation (SDT) can be used: **1**
(a) Only Top-Down Parser (b) Only Bottom-Up Parser
(c) Both (a) and (b) (d) None of these

ix. Which of the following symbol table implementation has the minimum access time? **1**
(a) Self-organizing list (b) Linear
(c) Search tree (d) Hash table

x. The graph that shows the basic blocks and their successor relationship is called- **1**
(a) Hamiltonian graph (b) Control graph
(c) Flow graph (d) DAG

Q.2 i. Find number of tokens: **2**

```
main ()
{
a = b + + + - - - - + + + = = ;
printf ("%d %d", a , b);
}
```

ii. What are the different types of compilers? Explain with an example. **3**

iii. Explain the phases of the compiler, with a neat diagram. **5**

OR iv. What are the advantage of dividing the design of a compilers into Front-end and Back-end? **5**

Q.3 i. What are the problems we face when designing the Top-Down Parser, mention some points. **2**

ii. Find First and Follow, of all non-terminal symbols for this grammar: **8**
E -> TE'
E'-> +TE'
E'-> Ɛ
T-> FT'
T'-> *FT'
T'-> Ɛ
F-> (E)
F-> id

OR iii. Find First and Follow, of all non-terminal symbols for this grammar: **8**
X-> A
A-> Bb | Cd
B->aB | Cd | Ɛ
C-> Cc | Ɛ

Q.4 i. Compare predictive parser and shift-reduce parser. **3**

ii. Construct Operator Precedence Table for the following grammar: **7**
E->E+E / E*E / id
Also discuss the disadvantage of this parser.

OR iii. Whether the given grammar is LR(0) and SLR(0): **7**
S->dA/aB
A->bA/c
B->bB/c

Q.5 i. What is Syntax Directed Translation scheme? **4**

ii. What is difference between S-attributes and L-attributes SDT. **6**

OR iii. What is Postfix notation? Translate (a+b) * (c+d) into postfix using Syntax Directed Translation. **6**

Q.6 Attempt any two:

i. Explain activation trees and activation records. **5**

ii. Explain error control and symbol table **5**

iii. Explain global data flow analysis **5**

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Marking Scheme

CS3CO27[T]- **Compiler Design**

Q.1 i) 'Turbo C' is which type of Compilers: **1**

a) Source/Naïve Compilers
b) Two Pass Compilers
c) **Both a and b (ANSWER)**
d) None of the above

ii) In Compiler lexical analyzer is used for? **1**

a) Removing comments
b) Removing whitespace
c) Breaking the syntaxes in the set of tokens
d) **All of the mentioned (ANSWER)**

iii) Parsing is categorized into how many types? **1**

a) three types
b) four types
c) **two types (ANSWER)**
d) five types

iv) Which of the following parser is a top-down parser? **1**

a) LALR parser
b) LR parser
c) Operator precedence parser
d) **Recursive descent parser (ANSWER)**

v) 'Shift reduce parsers are _____ **1**

a) Top-Down Parser
b) **Bottom-Up parser (ANSWER)**
c) May be top down or bottom up
d) None of the mentioned

vi) What is the similarity between LR, LALR and SLR? **1**

a) **Use same algorithm, but different parsing table (ANSWER)**
b) Same parsing table, but different algorithm
c) Their Parsing tables and algorithm are similar but uses top-down approach
d) Both Parsing tables and algorithm are different

vii) In a Bottom-Up evaluation of a Syntax Direction definition, inherited attributes can _____ **1**

a) Always be evaluated
b) **Be evaluated only if the definition is L–attributed(ANSWER)**
c) Evaluation only done if the definition has synthesized attributes
d) None of the mentioned

viii) Syntax Directed Translation (SDT) can be used: **1**

a) Only Top-Down Parser
b) Only Bottom-Up Parser
c) **Both a & b (ANSWER)**
d) None of the above

ix) Which of the following symbol table implementation has the minimum access time? **1**

(A) Self-organizing list
(B) Linear
(C) Search tree
(D) **Hash table (ANSWER)**

x) The graph that shows the basic blocks and their successor relationship is called. **1**

(A) Hamiltonian graph
(B) Control graph
(C) Flow graph (ANSWER)
(D) DAG

Q.2 i. Find number of Tokens: **2**

```
main ()
{
a = b + + + - - - - + + + = = ;
printf ("%d %d", a , b);
}
```

1/2 marks form example

ii. What are the different types of Compilers, explain with an example. **3**

1/2 marks for 1 type compiler definition

iii. Explain the phases of the compiler, with a neat diagram. **5**

Theory 3 Marks, diagram 2 Marks

OR	iv.	What is the advantage of dividing the design of a compilers into Front-end and Back-end? 5 advantages of each 2.5 for front and 2.5 par backend	**5**
Q.3	i.	What is the problem faced using Top-Down Parser, mention some points 2 problem	**2**
	ii.	Find First and Follow, of all non-terminal symbols for this Grammar: E -> TE' E'-> +TE' E'-> Ɛ T-> FT' T'-> *FT' T'-> Ɛ F-> (E) F-> id	**8**
OR	iii.	Find First and Follow, of all non-terminal symbols for this Grammar: X-> A A-> Bb | Cd B->aB | Cd | Ɛ C-> Cc | Ɛ	**8**
Q.4	i.	Compare Predictive Parser and Shift-Reduce Parser. At least 3 comparisons	**3**
	ii.	Construct Operator Precedence Table for the following grammar: E->E+E / E*E / id Table -3 Marks ,2 disadvantages – 2 marks Also discuss the disadvantage of this parser.	**7**
OR	iii.	Whether the given grammar is LR (0) and SLR (0): S->dA/aB A->bA/c B->bB/c	**7**
Q.5	i.	What is Syntax Directed Translation scheme? 2 Marks Definition 2 Marks	**4**
	ii.	What is difference between S-attributes and L-attributes SDT. 6 difference 6 marks	**6**
OR	iii.	What is Postfix notation definition 2 marks **SDT 2 MARKS** **TREE EX- 2 MARKS**	**6**
Q.6		Attempt any two:	
	i.	Explain Activation Trees 2.5 marks and Activation Records. 2.5 marks	**5**
	ii.	Explain Error Control 2.5 marks and Symbol table 2.5 marks	**5**
	iii.	Explain Global data flow analysis	**5**

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CS3C027 (3)

E → TE'
E' → +TE'
E' → ε
T → FT'
T' → *FT'
T' → ε
F → (E)
F → id

→ If only make table for this question only 4 marks

	first	follow
E	(, id	$,)
E'	+, ε	$,)
T	(, id	+, $,)
T'	*, ε	*, +, $,)
F	(, id	*, +, $,)

4 marks for first

4 marks for follow

(But step wise solution)

Q.3 iii) Remove left recursion (4)

$X \to A$

$A \to Bb \mid Cd$

$B \to aB \mid Cd \mid \epsilon$

$C \to c'$

$C' \to cC' / \epsilon$

If only make table for this question - only 4 marks

	First	follow
X	a, c, b, d, ϵ	$
A	a, c, b, d, ϵ	$
B	a, c, ϵ	b
C	c, ϵ	d
C'	c, ϵ	d

4 marks for first

4 marks for follow

(for step wise solution)