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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech (Integrated)

SEM: V - THEORY EXAMINATION (2022 - 2023)

Subject: Compiler Design

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A

20

1. Attempt all parts:-

- 1-a. The lexical analyzer takes \_\_\_\_ as input and produces a list of \_\_\_\_ as output. (CO1) 1
- (a) Machine code, mnemonic
- (b) Tokens, source code
- (c) Source code, tokens
- (d) Both Machine code, mnemonic and Tokens, source code
- 1-b. A compiler for a high level language that runs on one machine and produce code for different machine is called \_\_\_\_\_.(CO1) 1
- (a) One pass compiler
- (b) multipass compiler
- (c) croos compiler
- (d) optimizing compiler
- 1-c. Parsing is categorized into how many types?(CO2) 1
- (a) 2
- (b) 3

- (c) 1
- (d) 4
- 1-d. CLR parsing is a type of \_\_\_\_\_. (CO2) 1
- (a) Bottom-Up
- (b) Top-Down
- (c) Both Bottom-Up and Top-Down
- (d) None of above
- 1-e. Type checking is normally done during \_\_\_\_\_(CO3) 1
- (a) Lexical analysis
- (b) Syntax Analysis
- (c) Syntax directed translation
- (d) Code optimization
- 1-f. A parse tree showing the value of attributes at each node is called \_\_\_\_\_(CO3) 1
- (a) Syntax tree
- (b) Annotated parse tree
- (c) parse tree
- (d) All of the above.
- 1-g. Activation Record is a \_\_\_\_\_ (CO4) 1
- (a) Attribute
- (b) Non-Contiguous block of memory
- (c) Contiguous block of memory
- (d) None of above
- 1-h. Missing parenthesis is a \_\_\_\_\_(CO4) 1
- (a) Semantic error
- (b) Syntax error
- (c) Both Semantic Error and Syntax Error
- (d) None of above
- 1-i. Dead code plays no role in any program operation and therefore it can simply be eliminate (CO5) 1
- (a) TRUE
- (b) FALSE

	(c) Can be true or false	
	(d) Can not say	
1-j.	Code generation can be considered as the _____.(CO5)	1
	(a) first phase of compilation	
	(b) second phase of compilation	
	(c) third phase of compilation	
	(d) final phase of compilation	
2.	Attempt all parts:-	
2.a.	Differentiate between Token, Pattern, and Lexeme.(CO1)	2
2.b.	What is an operator precedence parser? (CO2)	2
2.c.	Explain S- attribute and L- attribute.(CO3)	2
2.d.	What are the goals of Error Handler? (CO4)	2
2.e.	Define DAG with examples.(CO5)	2
SECTION B		30
3.	Answer any <u>five</u> of the following:-	
3-a.	How to solve the source program to target machine code by using language processing system?(CO1)	6
3-b.	Classify the concepts of compiler and Interpreter. (CO1)	6
3-c.	Perform LL(1) parsing to parse string " a+a " by using the following grammar : (CO2)	6
	S->F	
	S->S+F	
	F->a	
3-d.	Parse string " ccdd " using given grammar with the help of shift-reduce parsing : (CO2)	6
	S->CC	
	C->cC	
	C->d	
3.e.	Consider the following SDTS. (CO3)	6
	E->E+T { E.val = E.val + T.val }	
	E -> T { E.val = T.val }	
	T -> T*F { T.val = T.val * F.val }	
	T -> F { T.val = F.val }	
	F -> INTLIT { F.val = INTLIT.lexval }	
	Using above SDTS, Construct parse tree and annotated parse tree for the given expression "	

$$2+3*4 \text{ " .}$$

- 3.f. Draw the format of Activation Record in stack allocation and explain each field in it (CO4) 6
- 3.g. Explain Peephole optimization with various techniques. (CO5) 6

### SECTION C 50

4. Answer any one of the following:-

- 4-a. Obtain Leftmost and Rightmost derivations for the input string **a+a\*a** using following Production rules- (CO1) 10
- $X \rightarrow X + X$
- $X \rightarrow X * X$
- $X \rightarrow a$
- Also draw Parse Tree for the same.
- 4-b. Define the term "Compiler". Explain the different phases of compiler in detail. Write down the output of each phase for the expression  $a:=b+c*50$ . (CO1) 10

5. Answer any one of the following:-

- 5-a. Construct CLR parsing table for the given grammar (CO2) 10
- $S \rightarrow AA$
- $A \rightarrow aA$
- $A \rightarrow b$
- Convert that table into LALR parsing table.
- 5-b. Write the algorithm for FIRST and FOLLOW. Also Find FIRST and FOLLOW sets of given production rules (CO2) 10
- $S \rightarrow aBDh$
- $B \rightarrow cC$
- $C \rightarrow bC / \epsilon$
- $D \rightarrow EF$
- $E \rightarrow g / \epsilon$
- $F \rightarrow f / \epsilon$

6. Answer any one of the following:-

- 6-a. Explain the syntax directed translation scheme and evaluate the expression  $(3*5+4)$  using simple Desk calculator. (CO3) 10
- 6-b. Compare between Quadruples , Triples and Indirect Triples. Also Translate the expression  $(p + q)*(q + r) + (p + q + r)$  into Quadruples , Triples and Indirect Triples representation. (CO3) 10

7. Answer any one of the following:-

- 7-a. Define Errors and its types with their Error Recovery methods . Explain with example. (CO4) 10
- 7-b. Explain the different Data Structures that can be used to implement Symbol tables.(CO4) 10
8. Answer any one of the following:-
- 8-a. Define the terms basic blocks, flow graphs and loop in flow graph. Generate the basic block and flow-graphs for the following expressions - (CO5) 10
- 1)  $r = 1$
  - 2)  $c = 1$
  - 3)  $t1 = 10 * r$
  - 4)  $t2 = t1 + c$
  - 5)  $t3 = 8 * t2$
  - 6)  $t4 = t3 - 88$
  - 7)  $a[t4] = 0.0$
  - 8)  $c = c + 1$
  - 9) if  $c \leq 10$  goto (3)
  - 10)  $r = r + 1$
  - 11) if  $r \leq 10$  goto (2)
  - 12)  $r = 1$
  - 13)  $t5 = c - 1$
  - 14)  $t6 = 88 * t5$
  - 15)  $a[t6] = 1.0$
  - 16)  $r = r + 1$
  - 17) if  $r \leq 10$  goto (13)
- 8-b. What is loop optimization? Explain in details about various loop optimization techniques with proper examples.. (CO5) 10