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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 (2025 - 2026)

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. Finite state Automaton are extensively used in compiler design for _____. (CO1,K3) 1
- (a) Code optimization
- (b) Code generation
- (c) Parser.
- (d) Lexical Analysis
- 1-b. The process of searching for matched tokens is typically described using _____. (CO1,K2) 1
- (a) Finite automata
- (b) Regular expressions
- (c) Context free grammar
- (d) Both Finite automata and Regular expressions
- 1-c. Left-Factoring is used to obtain _____. (CO2,K3) 1
- (a) Non-Deterministic Grammer
- (b) Deterministic Grammer
- (c) Context-Free Grammer
- (d) Ambiguous Grammer
- 1-d. SLR parsing uses. (CO2,K2) 1
- (a) LR(0)
- (b) LR(1)
- (c) None of the above
- (d) Both of the above

- 1-e. A parse tree showing the value of attributes at each node is called _____. (CO3, K1) 1
- (a) Syntax tree
 (b) Annotated parse tree
 (c) parse tree
 (d) All of the above.
- 1-f. Postfix notation of $a + b * c$ is _____. (CO3,k3) 1
- (a) $abc*+$
 (b) $abc+*$
 (c) $ba+c*$
 (d) None of the above
- 1-g. Activation Record is a _____. (CO4, K1) 1
- (a) Attribute
 (b) Non-Contiguous block of memory
 (c) Contiguous block of memory
 (d) None of above
- 1-h. Compiler makes use of _____. (CO4,K2) 1
- (a) Symbol tree
 (b) Symbol Table
 (c) Symbol list
 (d) None of the above
- 1-i. Optimization can be categorized broadly into _____ types. (CO5,K1) 1
- (a) 2
 (b) 3
 (c) 4
 (d) 5
- 1-j. Code generation can be considered as the _____. (CO5, K1) 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. Define bootstrapping with example.(CO1,K1) 2
- 2.b. Define leftmost derivation.(CO2,K2) 2
- 2.c. Define Parse Tree. (CO3, K1) 2
- 2.d. Explain the main purpose of using symbol table. (CO4, K2) 2
- 2.e. Define inner loop.(CO5,K2) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	Explain the front-end and back-end phases of a compiler. (CO1,K2)	6
3.a.(ii)	Compare and contrast compiler, interpreter, assembler, linker, and loader. (CO1, K4)	6
3.b.	Answer any one of the following:-	
3.b.(i)	Construct LR(0) parsing table for the given grammar : (CO2,K3) S->AA A->aA A->b	6
3.b.(ii)	Explain recursion and its types with examples, Remove left recursion from given grammar :(CO2,K3) E->E(T) / T T->T(F) / F F->id .	6
3.c.	Answer any one of the following:-	
3.c.(i)	Define term array also write difference between one dimension and two dimension array with example.(CO3,K2)	6
3.c.(ii)	Explain the three address code for procedure call with example. (CO3,K3)	6
3.d.	Answer any one of the following:-	
3.d.(i)	Describe the various data structure of the symbol table.(CO4, K2)	6
3.d.(ii)	Explain format of symbol table with example.(CO4,K2)	6
3.e.	Answer any one of the following:-	
3.e.(i)	Compare machine dependent code optimization techniques with example.(CO5,K2)	6
3.e.(ii)	Describe Peephole optimization with various techniques. (CO5,K2)	6
SECTION-C		50
4.	Answer any <u>one</u> of the following:-	
4-a.	Describe the Cross Compiler with example. Explain the analysis and synthesis model of compilation. (CO1, K2)	10
4-b.	Explain the various phases of a compiler in detail. Also write down the output for the following expression after each phase P: = I+R*60. (CO1,K4)	10
5.	Answer any <u>one</u> of the following:-	
5-a.	State the algorithm for FIRST and FOLLOW functions . Also Identify FIRST () and FOLLOW () for given production rules. (CO2, K2) S -> aBDh B -> cC C -> bC / ε D -> EF E -> g / ε F -> f / ε	10
5-b.	Explain the different types of LR parser? Explain any one of them by using example.(CO2,K2)	10
6.	Answer any <u>one</u> of the following:-	
6-a.	How is the switch case statement translated into three address code? Illustrate with	10

example. (CO3,K3)

- 6-b. Define Three Address Code also discuss the representations of three address code. Write the quadruples, triples, Indirect Triples for the following expression. $(x + y) * (y + z) + (x + y + z)$. (CO3,K3) 10
7. Answer any one of the following:-
- 7-a. Discuss the various Storage Management techniques available. What are their importance in compiler design.. (CO4,K2) 10
- 7-b. Explain Dynamic storage allocation with examples and diagram.(CO4,K2) 10
8. Answer any one of the following:-
- 8-a. Define the terms basic blocks, flow graphs and loop in flow graph also write the algorithm for partitioning of basic block. Generate the basic block and flow-graphs for the following expressions - (CO5,K4) 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. List and explain the name of Loop optimization technique with suitable example.(CO5,K2) 10