

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2024 - 2025)

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. Constructs the desired target program from the intermediate representation of the source program- (CO1,K1) 1
- (a) Analysis part
- (b) Lexical part
- (c) Synthesis part
- (d) None of these
- 1-b. Lexical analysis is about breaking a sequence of characters into _____. 1
- (CO1,K2)
- (a) Tokens
- (b) Lines
- (c) Groups
- (d) Packets
- 1-c. _____ function can be used to constructing transitions of the automaton in the parsing methods. (CO2,K2) 1
- (a) STATE
- (b) MOVE
- (c) CLOSURE
- (d) GOTO
- 1-d. Select the element needs to be incorporated into an LR (0) item in order to analyze 1

and transform it into an LR (1) item. (CO2,K2)

- (a) dollar
- (b) lookahead
- (c) start symbol
- (d) none of above

1-e. Postfix notation of $a + b * c$ is ____ . (CO3,k3) 1

- (a) abc^{*+}
- (b) $abc+^{*}$
- (c) $ba+c^{*}$
- (d) None of the above

1-f. The _____ is the pictorial representation of derivations. (CO3,K2) 1

- (a) The oct tree
- (b) Parse Tree
- (c) Binary Tree
- (d) None of the above

1-g. _____ is the most efficient data structure in the case of symbol table implementation has minimum access time. (CO4,K3) 1

- (a) Self-organizing list
- (b) Search tree
- (c) Hash table
- (d) linear list

1-h. `int a = "hello";` identify error in the given code. (CO4,K2) 1

- (a) Syntax error
- (b) Semantic error
- (c) Target code error
- (d) None of above

1-i. Structure preserving transformations on basic blocks are____-(CO5, K1) 1

- (a) Common sub-expression elimination
- (b) Dead-code elimination
- (c) Renaming of temporary variables
- (d) All the above

1-j. DAG representation of a basic block allows____. (CO5,K2) 1

- (a) Automatic detection of local common sub expressions
- (b) Automatic detection of induction variables
- (c) Automatic detection of loop variant instructions
- (d) None of the above

2. Attempt all parts:-

2.a. Define compile time,load time,run time in the language processing system.(CO1,K1) 2

- | | | |
|------|---|---|
| 2.b. | Differentiate between LR(0) and LR(1) Canonical items. (CO2,K3) | 2 |
| 2.c. | Define the term backpatching. (CO3,K1) | 2 |
| 2.d. | List out the goals of Error Handler. (CO4, K1) | 2 |
| 2.e. | Discuss the issues in the design of code generators. (CO5,K1) | 2 |

SECTION-B

30

3. Answer any five of the following:-

- | | | |
|------|---|---|
| 3-a. | Differentiate between a) Native compiler and Cross Compiler b) one pass compiler and multi pass compiler (CO1,K4) | 6 |
| 3-b. | Illustrate Compiler Construction Tools and Bootstrapping with example. (CO1,K2) | 6 |
| 3-c. | Define Types of conflict in the LR parsing table. How do you resolve conflicts in an LR parsing table. (CO2,K2) | 6 |
| 3-d. | Define shift reduce parser and its operations. consider the given grammar. (CO2,K4)
$S \rightarrow S + S$
$S \rightarrow S * S$
$S \rightarrow id$
Perform Shift Reduce parsing for input string "id + id + id" | 6 |
| 3.e. | Elaborate syntax directed translation scheme. and different forms of intermediate code. (CO3, K2) | 6 |
| 3.f. | Define and distinguish between static scope and dynamic scope with example. Briefly explain access to non-local Names in static scope. (CO4,K4) | 6 |
| 3.g. | Describe Peephole optimization with various techniques. (CO5,K2) | 6 |

SECTION-C

50

4. Answer any one of the following:-

- | | | |
|------|---|----|
| 4-a. | Define Regular Expression and its properties also Construct the NFA for the regular expression $bc(ab+c)^*a^+$ by using Thompson's construction methodology. (CO1,K4) | 10 |
| 4-b. | Define lexeme, Token and pattern with example also Illustrate the phases of compiler with following Expression $a = a + b * c * 2$ (CO1,K3) | 10 |

5. Answer any one of the following:-

- | | | |
|------|---|----|
| 5-a. | Construct CLR parsing table for the given grammar (CO2,K4)
$S \rightarrow AA$
$A \rightarrow aA$
$A \rightarrow b$
Convert that table into LALR parsing table. | 10 |
| 5-b. | Write down the algorithm for first and follow and Find out FIRST and FOLLOW sets of the given production rules. (CO2,K3)
$S \rightarrow aXZh$
$X \rightarrow cY$
$Y \rightarrow bY / \epsilon$
$Z \rightarrow EF$
$E \rightarrow g / \epsilon$
$F \rightarrow f / \epsilon$ | 10 |

6. Answer any one of the following:-

6-a. Differentiate between S- attributes and L- attributes. Translate the following expression into quadruple, triple, and indirect triple: $-(a+b)*(c+d)-(a+b+c)$. (CO3,K4) 10

6-b. Explain three address code Representation form with example and write the three-address code for the following program. (CO3,K3) 10

```
switch(i+j)
{
Case 1: x= y+z
Case 2: u= v+w
Default: p= q+r
}
```

7. Answer any one of the following:-

7-a. Define activation of procedure. How it can be represented with activation record and activation tree. Explain with quick sort example (CO4,K3) 10

7-b. Discuss the various Storage Management techniques available. What are their importance in compiler design.. (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. Discuss the following Optimization techniques with example. (CO5,K3) 10

- a) Frequency reduction
- b) Loop Unrolling
- c) Loop Fusion
- d) Dead code elimination
- e) Strength reduction

COP:JULY_DEC-2024