

KATHMANDU UNIVERSITY  
End Semester Examination  
February/March, 2025

Marks Scored:

Level : B.Sc.

Year : III

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : COMP 409

Semester : II

F. M. : 10

Date : 03 MAR 2025

SECTION "A"

[20 Q. × 0.5 = 10 marks]

**Choose and encircle the most appropriate option from each set of choices**

1. Which of the following phases of compiler gives the output as an intermediate code representation?
  - a. Synthesis Phase
  - b. Lexical Analysis
  - c. Syntax Analysis
  - d. Analysis Phase
2. Which of the following statement is **TRUE**?
  - a. Lexical Analyzer returns a list of tokens from the source program.
  - b. Lexical Analyzer returns a token only when the parser asks a token from it.
  - c. Lexical Analyzer only performs the auxiliary operations.
  - d. Lexical Analyzer only fills the information in the Symbol Table.
3. The output of the Syntax Analyzer is \_\_\_\_\_
  - a. Syntax Tree
  - b. DAG
  - c. Annotated Parse Tree
  - d. Binary Tree
4. The input for the Semantic Analyzer is \_\_\_\_\_ NFA differs from DFA with its
  - a. Syntax tree
  - b. Syntactically correct expression
  - c. Evaluation Tree
  - d. Context Free Grammar
5. Which of the following operation is used to search for a name and return a pointer to its entry in the symbol table?
  - a. set\_attribute
  - b. get\_attribute
  - c. insert
  - d. lookup
6. What is the purpose of Thomson's Construction method?
  - a. Show the equivalence between two DFAs.
  - b. Convert the DFA into NFA.
  - c. Convert the Regular Expression into NFA.
  - d. Convert the NFA into equivalent DFA.
7. Which of the following technique increase the efficiency of scanning process?
  - a. Input Buffering
  - b. Input Tabulation
  - c. Parsing Table
  - d. Input Mapping
8. Which of the following represents the set of all strings that describe alternating 1s and 0s?
  - a.  $(01)^+(01)^*$
  - b.  $(01)^+(10)^*$
  - c.  $(01)^*(01)^*$
  - d.  $(01)^*(10)^*$
9. Which of the following condition is true for a grammar  $G = (V, T, P, S)$  to be an ambiguous grammar?
  - a. If there is two or more distinct derivation tree rooted at S and yielding variables.
  - b. If there is more than one leftmost derivation for string w rooted at any V.
  - c. If there is two or more distinct derivation tree rooted at S and yielding string w.
  - d. If there is one left most and one right most derivation for string w.

10. What is the First Position value of node  $n$  with left child  $c_1$  and right child  $c_2$ , if  $c_1$  is nullable?
- Firstposition( $c_1$ )
  - Firstposition( $c_2$ )
  - Firstposition( $c_1$ )  $\cup$  Firstposition( $c_2$ )
  - Firstposition( $c_1$ ) Firstposition( $c_2$ )
11. If  $n$  is cat-node with left child  $c_1$  and right child  $c_2$  then for each  $i$  in last-position( $c_1$ ); follow-position( $i$ ) is \_\_\_\_\_
- follow-position( $i$ )  $\cup$  first-position( $c_1$ )
  - first-position( $i$ )  $\cup$  first-position( $c_1$ )
  - follow-position( $i$ )  $\cup$  first-position( $c_2$ )
  - follow-position( $i$ )  $\cup$  follow-position( $c_1$ )
12. The syntax analyzer creates a parse tree for the given program if it satisfies \_\_\_\_\_
- rules implied by regular grammar
  - the rules of simplified grammar
  - rules of Push Down Automata
  - rules implied by Context free Grammar
13. Which of the following condition is true for a grammar  $G$  to be an ambiguous grammar??
- If there is a string  $w \in L(G)$  for which we can construct more than one parse tree rooted at start symbol of the production.
  - If there is multiple derivations for a string  $w$ .
  - If there is no left most recursion in the grammar.
  - If the grammar is in CNF form.
14. Which of the following is left recursive grammar?
- $S \rightarrow AA' \mid 0, A \rightarrow 0SA' \mid 1A, A' \rightarrow ASA' \mid \epsilon$
  - $S \rightarrow AA \mid 0, A \rightarrow AAS \mid 0S \mid 1$
  - $S \rightarrow AA \mid 0, A' \rightarrow ASA' \mid \epsilon$
  - $S \rightarrow AA \mid 0, A \rightarrow 0SA', A' \rightarrow ASA'$
15. Which of the following parsing technique use the backtracking?
- Predictive Parsing
  - Non-recursive predictive parsing
  - both a and b
  - Recursive descent Parsing
16. Which of the following conditions must be satisfied to construct LL(1) parsing table?
- Grammar should be left recursion free
  - Grammar should be left factor free.
  - Both a and b.
  - Grammar should be in GNF.
17. A substring that can be replaced by a non-terminal when it matches its right sentential form is called \_\_\_\_\_?
- yield
  - handle
  - descendant
  - lookhead
18. The attributes of a node that are derived from its children nodes are \_\_\_\_\_
- Inherited attributes.
  - Terminal attributes.
  - Synthesized attributes.
  - Hybrid attributes.
19. The process of converting one type to another type by compiler itself is known as \_\_\_\_\_
- type casting
  - explicit type conversion
  - implicit type conversion
  - coercion
20. Which of the following is not the intermediate representation in the compilation process?
- Syntax Tree
  - Directed Acyclic Graph
  - Three Address Code
  - Infix Notation

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SECTION "B"

[6 Q. × 4 = 24 marks]

*Attempt ANY SIX questions.*

1. Consider the following code that is fed to the Lexical Analyzer:  

```
#include<stdio.h>
int greatest(int a, int b)
{
    if(a>b) // This will compare the two numbers
        return a;
    else return b;
}
```

List out the lexeme with their respective tokens and patterns. [4]
2. What is the role of Error Handler in the different stages of compilation process? Explain. [1+3]
3. Write down the regular expressions for the following regular language. [2+2]
  - a. The set of strings having at most two 0's where input alphabet is 0 and 1.
  - b. The set of identifiers in C programming language.
4. Calculate the follow position of the regular expression:  $(0|1)^*0$ . [4]
5. How Predictive Parsing differs from the Recursive-Descent Parsing? Explain.
6. Why Syntax Directed Definition (SDT) is important in compilation process? Given the following grammar:  
 $T \rightarrow FT' | T * F | F$   
 $F \rightarrow \text{num}$   
Define it's SDT and also list out either the attributes are inherited or synthesized. [1+3]
7. How three-address code can be used as the intermediate code representation? Explain with example. [4]

SECTION "C"

[2 Q. × 8 = 16 marks]

*Attempt ANY TWO questions.*

8. How LR(1) parsing table differs from SLR parsing table? Determine either the Given grammar is LR(1) grammar or not. [8]  
 $S \rightarrow CC$   
 $C \rightarrow cC$   
 $C \rightarrow d$

P.T.O.

9. What are the different approaches of Code Optimization techniques? Explain in details with example. [8]
10. Write short notes with example. [4+4]
- a. Directed Acyclic Graph
  - b. Annotated Parse Tree