

**AMITY SCHOOL OF ENGINEERING AND TECHNOLOGY**  
**MID TERM EXAMINATION (February-March, 2022)**  
**[B.Tech -CSE] [6<sup>th</sup> Semester]**  
**CSE304: Compiler Construction**

**Time 1 Hr**

**Max. Marks: 30**

**SECTION-A** (Attempt any two questions out of three. Each question carries 06 marks)

**Q.1 (a)** Consider a production of the form  $X \rightarrow Y_1 Y_2 Y_3 Y_4 Y_5$  where all these symbols are nonterminal and Only nonterminal  $Y_1, Y_2, Y_3$  and  $Y_5$  derives  $\epsilon$  (Note that  $Y_4$  does not derive  $\epsilon$ ). Write a general rule for calculating **FIRST(X)** and **FOLLOW( $Y_4$ )**.

**(b)** Calculate the **FIRST(S)** and **FOLLOW(C)** for the following grammar :

$S \rightarrow ACB|CDB|Ba \quad A \rightarrow da|BC \quad B \rightarrow g|\epsilon \quad C \rightarrow h|\epsilon$

**Q.2 (a)** Consider the following table for precedence (1 means Highest, 4 means lowest) and associativity of the operator #, %, \$ and @.

	#	%	\$	@
Precedence	1	2	3	4
Associativity	Left to right	Right to left	Right to left	Left to right

Write an unambiguous context free grammar (CFG) to preserve the precedence and Associativity of the operators defined in the table.

**(b)** Count the number of tokens in the following C statement:

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

**Q.3** Find the deterministic finite automata (DFA) for the following over given input alphabet.

(a)  $((01)^* + (0 + 1)^*)^*$  where  $\Sigma \in \{0,1\}$

(b)  $L = \{w \mid w \in \{a,b\}^* \text{ where } w \text{ has at least one } a\text{'s and exactly two } b\text{'s}\}$ .

**SECTION-B** (Attempt any two questions out of three. Each question carries 06 marks)

**Q.4:** Consider the following grammar G1 and G2. Find whether the grammar G1 and (or) G2 are ambiguous or unambiguous?

**G1:**  $S \rightarrow AB|aAB \quad A \rightarrow aA|\epsilon \quad B \rightarrow bB|\epsilon$

**G2:**  $S \rightarrow A|B \quad A \rightarrow aAb|ac \quad B \rightarrow aB|\epsilon$

**Q.5:** Check whether the grammar  $G = (N, T, P, S)$  is LL(1) or not? Note that capital letter is a non-terminal and small letter are terminal.

$N \rightarrow \{S, A, B, C\} \quad T \rightarrow \{a, b, c\} \quad P \rightarrow \{S \rightarrow aBC, A \rightarrow aBC, C \rightarrow (cC|c\}$

**Q.6:** Give the regular expression for the compiler for the following statement:

$\lambda = a^m b^n c^p$  (Where  $a, b, c$  are non-terminals and  $a$  and  $b$  are integer variables)

**Section - C : Computational question**

**(4+2=06 marks)**

**Q.7 (a)** Construct a predictive parsing table (PPT) for the following grammar:

$X \rightarrow ABC|yzB|B \quad A \rightarrow aA|A \quad B \rightarrow b|\epsilon \quad C \rightarrow c|\epsilon$

**(b)** Parse the string  $ax$  using PPT in part 7(a).