

	Course Name:	Theory of Automata	Course Code:	
	Degree Program:	BS(CS)	Semester:	Fall 2025
	Section:	3A,3B,5F	Marks:	30
	Assignment	2	Deadline	29 th Nov 2025

Q1: Generate CFG for the following: (2*6)

- a) $L = \{a^n b^m c^m d^n ; n, m \geq 2\}$
- b) $\{ w \in \{0, 1\}^* \mid \text{the length of } w \text{ is odd and the middle symbol is } 1 \}$
- c) $\{ a^i b^j c^k \mid i, j, k \geq 0, \text{ and } i = j \text{ or } i = k \}$
- d) $L = \{0^i 1^j 0^k \mid j > i + k; i, j, k \geq 0\}$
- e) $L = \{ a^i b^j c^k \mid i \leq 2j; i \geq 0; k \geq 0 \}$
- f) $\{ i^a j^b k^c \mid a, b, c \geq 0 \text{ and } a+b = c \}$

Q2: Convert the following CFG to CNF: (4*3)

- a) $S \rightarrow T U \mid V$
 $T \rightarrow aT b \mid \epsilon$
 $U \rightarrow cU \mid \epsilon$
 $V \rightarrow aV c \mid W$
 $W \rightarrow bW \mid \epsilon$

- b) $S \rightarrow ASB$
 $A \rightarrow aAS \mid a \mid \epsilon$
 $B \rightarrow SbS \mid A \mid bb$
- c) $S \rightarrow BSB \mid B \mid \epsilon$
 $B \rightarrow 11 \mid \epsilon$

Q3: Use CYK Parser to check if the following strings belong to the following CNFs: (2*3)

- a) $w = baaba$ on
 $S \rightarrow AB \mid BC$
 $A \rightarrow BA \mid a$
 $B \rightarrow CC \mid b$
 $C \rightarrow AB \mid a$

b) $w = abbaba$ on the CNF obtained in Q2 b)

c) $w = ababb$ on

$$S \rightarrow AB \mid BC$$

$$A \rightarrow BB \mid a$$

$$B \rightarrow BA \mid b$$

$$C \rightarrow AC \mid AA \mid a$$