



Q.1. Give short answers to the following questions.

1. Write regular expression for the language that must contain at most two a ., over input alphabets $\Sigma = \{a,b,c\}$. [5 marks]
2. Draw DFA for the language that must contain exactly that must contain at most two a ., over input alphabets $\Sigma = \{a,b,c\}$. [5 marks]
3. Design mealy and moore machine that simulates the process of an incrementor. [3+3=6 marks]
4. Context-sensitive languages are closed under which operators? [5 marks]
5. What is pumping lemma? Explain its purpose? [5 marks]
6. Is the following grammar ambiguous, explain?
 $S \rightarrow a \mid b \mid SS \mid S \times S \mid Sa \mid bS$ [4 marks]

Q.2. Answer the following questions in detail.

(5x6=30)

1. Convert following CFG to CNF, and also draw the corresponding PDA. [6+4=10 marks]
 $S \rightarrow CSD \mid CS \mid SD$
 $C \rightarrow cCS \mid \epsilon \mid c \mid C$
 $D \rightarrow SdS \mid C \mid dD$
2. Write the Context Sensitive Grammar for the language $a^{2n}c^nd^n; n \geq 3$, and draw the TM for the language as well. [4+6=10 marks]
3. Write the Context Free Grammar for the language $a^nc^nb^{3m}; n \geq 2, m \geq 0$ and draw the corresponding PDA. [6+4=10 marks]