Q.1)  a) Convert the following CFG to Chomsky normal form (CNF):
S → ASA|aB
A → B|S
B → b| A

b) Find a regular expression for all strings that have exactly one triple letter in them.

Q.2) Draw a Mealy machine that can count how many times the double letters (aa or bb) occurs in an input string, then convert it to Moore machine.

Example: if your input is: abaababbab then the output will be 0001000100

Q.3) Draw FA that accepts all words without substring (001)

Q.4) a) Find the CFG for the language \( L = \{ b^n a^m c^{2n} \mid n, m \geq 0 \} \).

b) Convert the following CFG to Greibach normal form (GNF):
S → XA|BB
B → b|SB
X → b
A → a

Q.5) Find Push down automata (PDA) that accepts the language \( L = \{ a^x b^y c^z d^x \mid x=1,2,3; y=0,1,2; z=0,1,2 \} \).

Q.6) Find a Turing machine (TM) for the language: \( L = \{ a^n b^{n+1} \mid n \geq 1 \} \).

Q.7) If \( \Sigma = \{a,b\} \), \( \text{RE1} = (a+b)^*aa(a+b)^* \) and \( \text{RE2} = (a+b)^*b \), find FA that accepts the language defined by:
\( \text{RE} = \text{RE1} + \text{RE2} \) by using Kleen’s theorem.