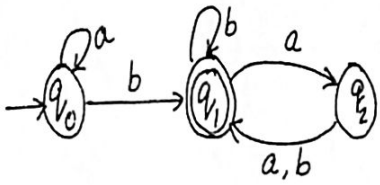
FLAT SET-A

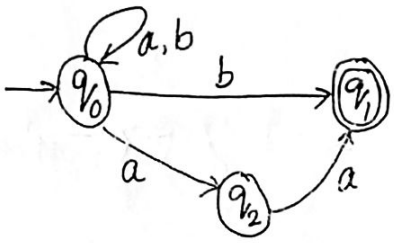
CA-1 FM-20 Time-1H

Write your name, roll number, and Q set no. on Answer sheet. Answer all questions. Write clearly in the sense of logic, language and legibility. The clarity of your answers affects your mark.

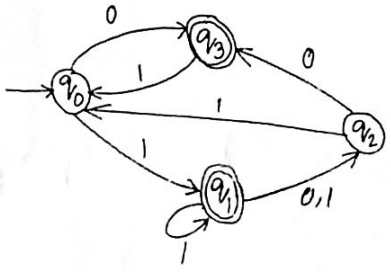
1. Consider the following FA. Show the path(s) for the input: *aaba* then tell why the input is accepted/rejected? [3][CO1]



2. Derive the patterns accepted by the following FA. [5][CO3]



3. Consider the following FA. Compute $\delta^*(q_0, 1101)$ using recursive definition of δ^*. show each step clearly. [5][CO3]



4. Suppose $L_1 = \{10, 11\}$ and $L_2 = \{10, 01\}$. Compute $L_1 \cup L_2^R$ and $L_1.L_2$. [4][CO1]

5. Consider the language L^*, where $L = \{0, 11\}$. List the strings this language have of length 2 and 3. [3][CO1]

FM-20 **Time - 15** **Date - 23/12/2024**

Q1. Run the DFA minimization algorithm (Table filling) on the following DFA (Fig. -1). Clearly show the different stages that the minimization algorithm goes through. [7]

Q2 For the following CNF, using CYK algorithm check the membership of the string ***abaab*** [6]

S → CF | DE | AB D → BA | b E → SD

A → AA | a B → BA | b C → FS F → AB | a

Q3. Consider the given PDA, M (Fig. - 2). Show the derivation steps for the string ***abaaba***(use ID's). [7]

Initial stack Z

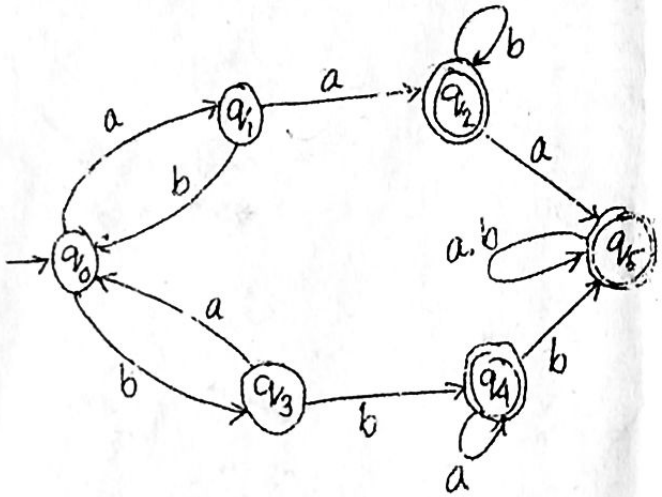


Fig. - 1

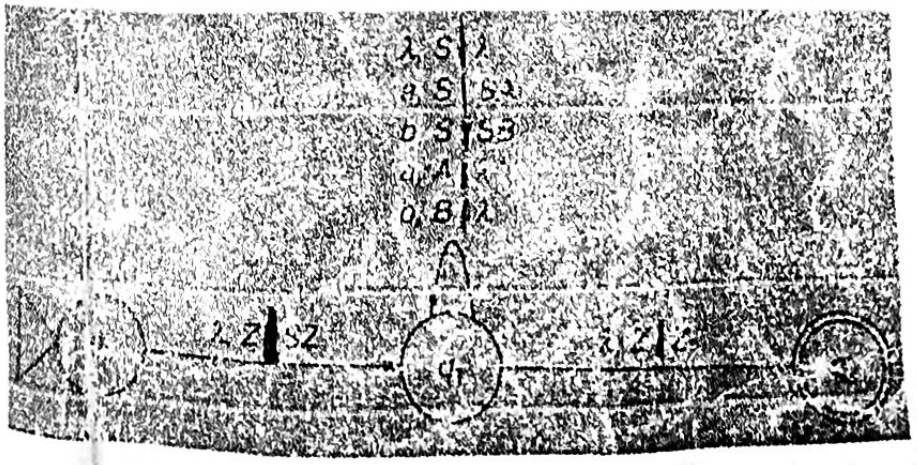


Fig. - 2

Formal Language & Automata Theory - 2024

SET-A

CA-2

FM-20 Time – 1H Date-11/12/2024

1. Find a FA that accepts the language L(G), where [5]

   G: S → aA | bB | b
      A → aS | bC
      B → bS | aC | bA
      C → aB

2. Show that the grammar G = (<S,A>,<a,b>,S,P) is ambiguous, where P: {S → aSA | ε, A → bA | ε}. [3]

3. Simplify the grammar G = (<S,A,B,C,D>,<a,b,c,d>,S,P), where [7]
   P: {S → AB | a, A → CD, B → bAB | ε, C → dSd |c, D → cCD | ε}

4. Convert the grammar G = (<S,A,B>,<a,b,c>,S,P) into CNF by removing 'mixed bodies' and 'long terms', where P = {S → cBA | BbBb, A → cB | AbbS, B → aaa | ab} [5]

FLAT

SET-C

FM-20 Time - 1H CA-IV Date - 14/01/2025

Q1. Convert the following CFG G into a PDA M, such that L(M) = L(G). [6]

$S \rightarrow 0S1 \mid A \mid bB$

$A \rightarrow 1A0 \mid S \mid \epsilon$

$B \rightarrow b \mid \epsilon$

$C \rightarrow a$

Q2. Obtain a CFG for a PDA with the following transition functions: [7]

$\delta(q_0, b, Z_0) = (q_0, Z)$

$\delta(q_0, \epsilon, Z_0) = (q_1, \epsilon)$

$\delta(q_1, b, Z) = (q_1, ZZ_0)$

$\delta(q_1, a, Z_0) = (q_0, Z_0)$

Q3. Given a TM with the following transition functions and q_4 is the final state of the machine: [7]

$\delta(q_0, a) = (q_1, 0, R)$.

$\delta(q_1, a) = (q_1, a, R)$

$\delta(q_1, b) = (q_2, 1, L)$

$\delta(q_2, a) = (q_2, a, L)$

$\delta(q_3, 1) = (q_3, 1, R)$

$\delta(q_0, 1) = (q_3, 1, R)$

$\delta(q_1, 1) = (q_1, 1, R)$

$\delta(q_2, 1) = (q_2, 1, L)$

$\delta(q_2, 0) = (q_0, 0, R)$

$\delta(q_3, B) = (q_4, B, R)$

Derive the tape content for input: aabb (use ID's).