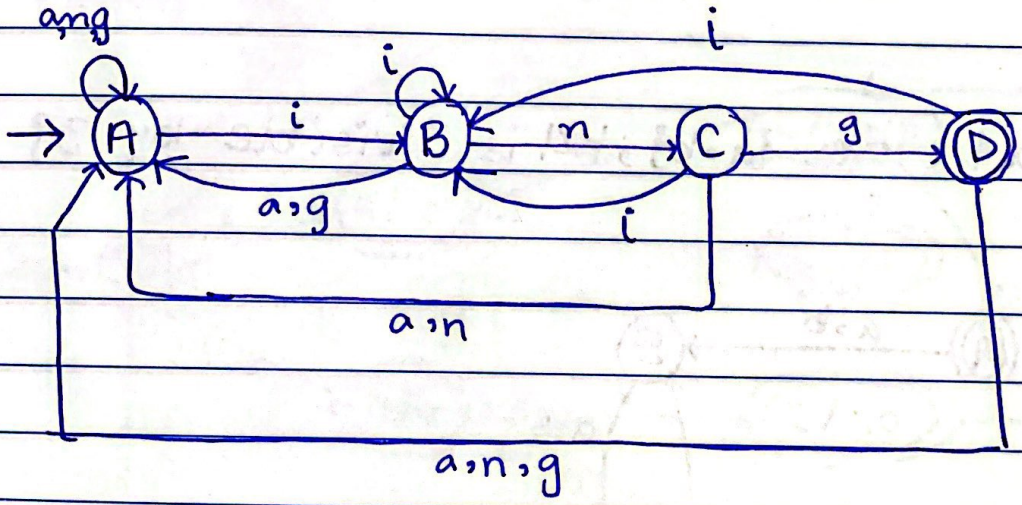
Foundation for Advancement of Science & Technology

THEORY OF AUTOMATA

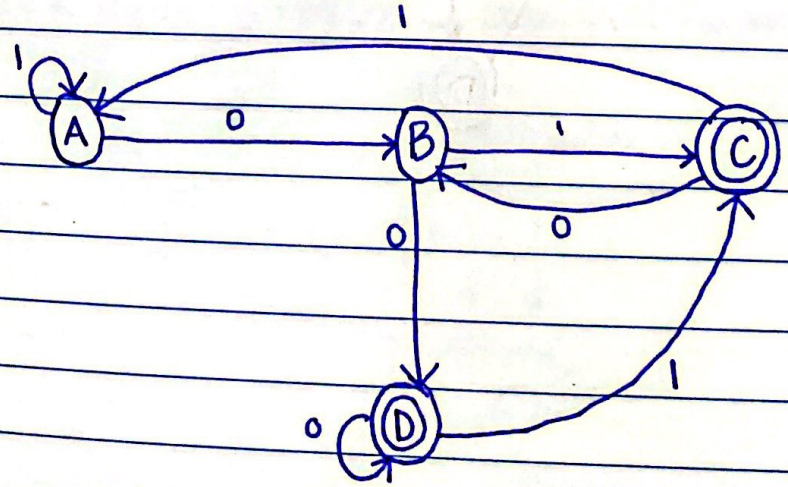
Assignment 01

Q#02:

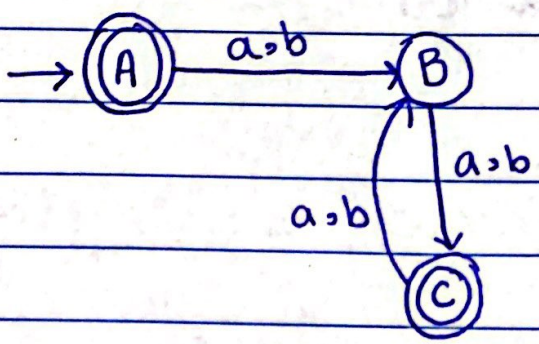
(i) L = {x | x over {a, i, n, g}; x ends with "ing"}



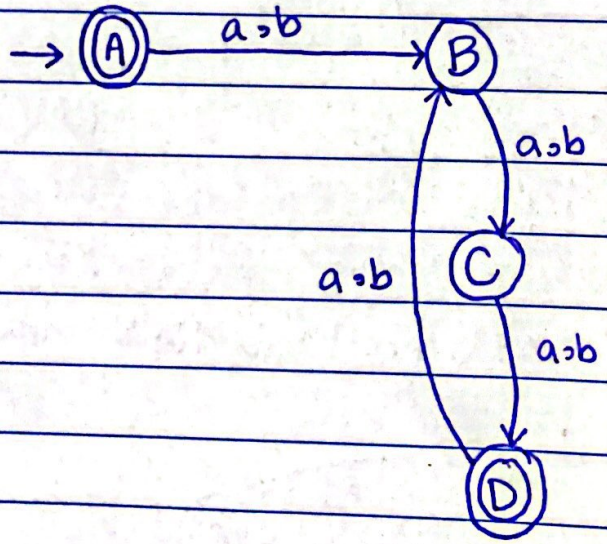
(ii) L = {x | x over {0, 1}; x's 2nd last digit must be 0}



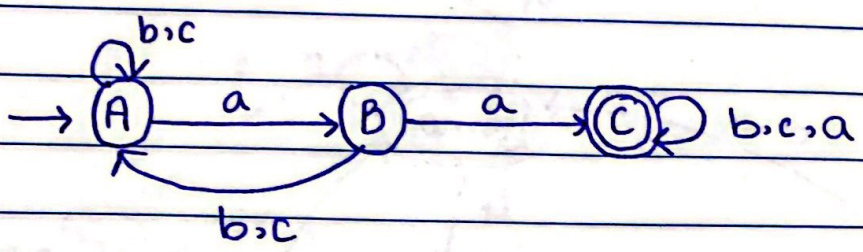
(iii) $L = \{x \mid x \text{ over } \{a, b\}; |x| \text{ is divisible by } 2\}$



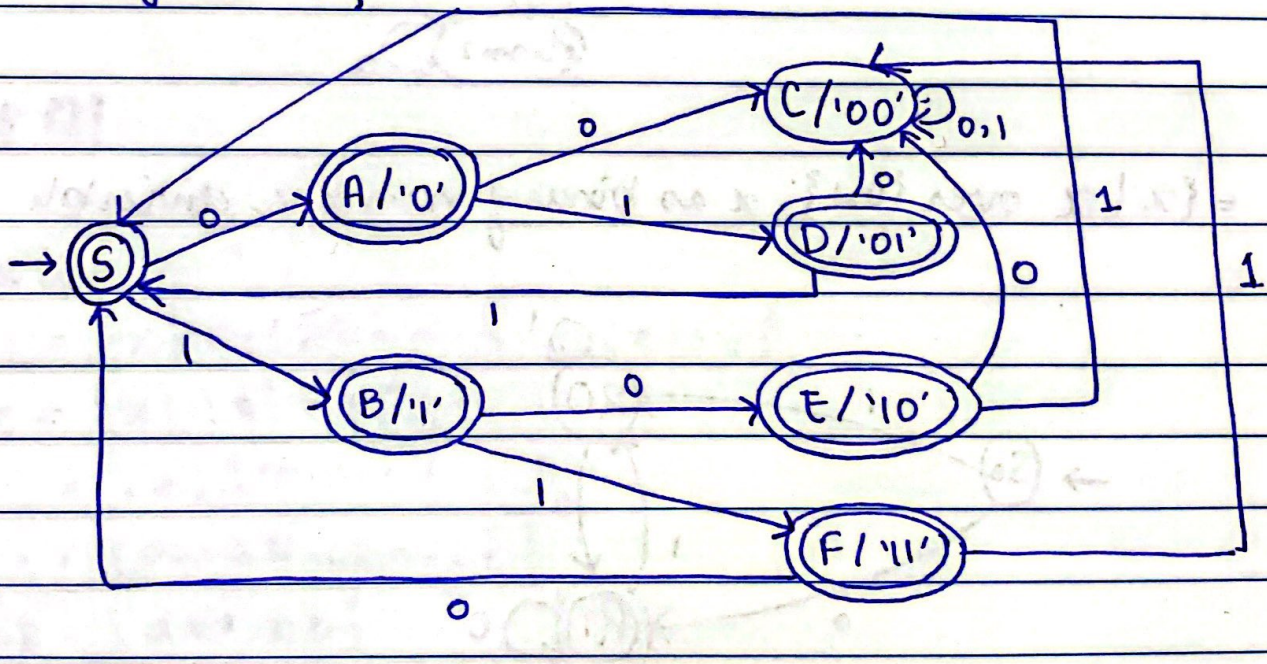
(iv) $L = \{x \mid x \text{ over } \{a, b\}; |x| \text{ is divisible by } 3\}$



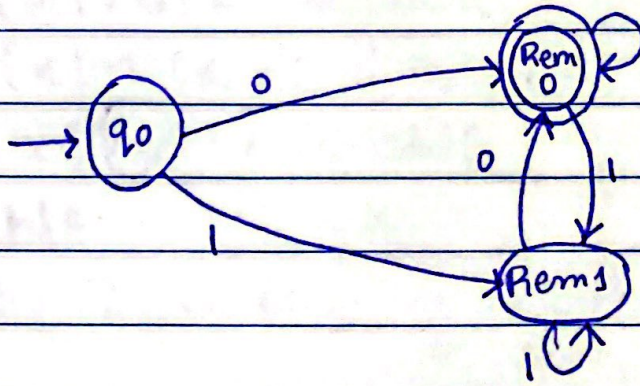
(v) $L = \{x \mid x \text{ over } \{a, b, c\}; x \text{ contains 'aa' as substring}\}$



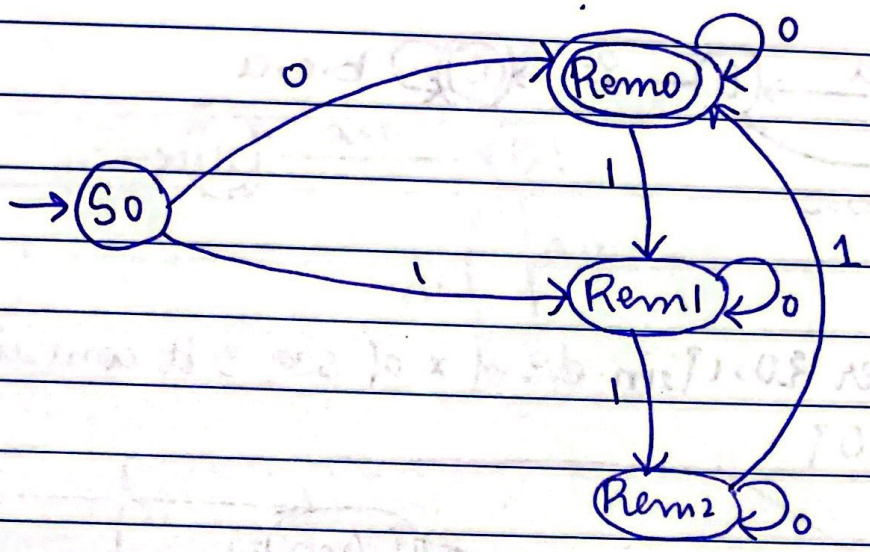
(vi) $L = \{x \mid x \text{ over } \{0,1\}; \text{in every } x \text{ of seq 3 it contains exactly one } 0\}$



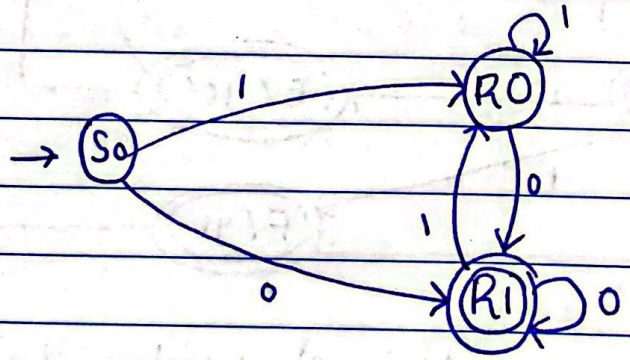
(vii) $L = \{x \mid x \text{ over } \{0,1\}; x \text{ as decimal number div by } 2\}$



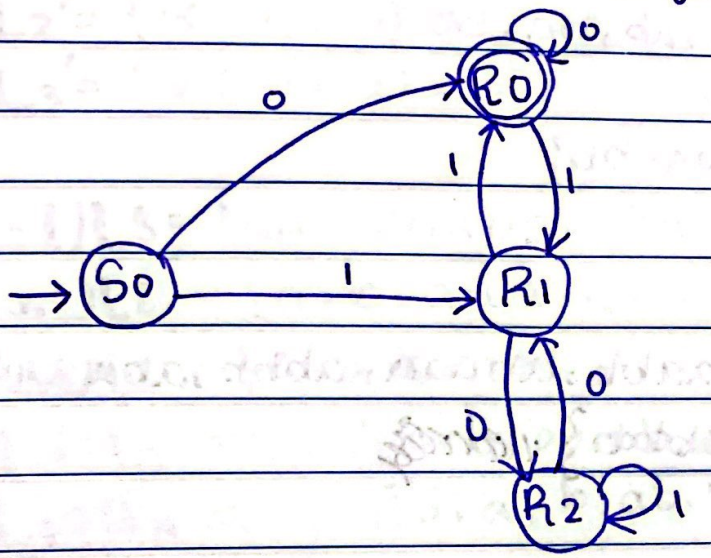
(viii) $L = \{x \mid x \text{ over } \{0,1\};\ x \text{ as decimal number div by } 3\}$



(ix) $L = \{x \mid x \text{ over } \{0,1\};\ x \text{ as binary number divisible by } 2\}$



(x) $L = \{x \mid x \text{ over } \{0,1\}; x \text{ as binary number div by } 3\}$



Q#01:

a) Finite:

- $L_2 = \{x \mid n_a(x) = 2 \ \& \ n_b(x) = 2\}$
- $L_5 = \{x \mid |x| <= 2\}$
- $L_6 = \{x \mid |x| = 1\}$
- $L_7 = \{aa, ab, aba, bb\}$
- $L_8 = \{aaa, bb\}$

Infinite:

- $L_1 = \{x \mid n_a(x) \text{ is even}\}$
- $L_3 = \{x \mid n_a(x) = 0 \ \& \ n_b(x) \text{ is odd}\}$
- $L_4 = \{x \mid n_a(x) \text{ is odd}\}$

Countable:

All the finite sets are countable.

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b) $L_2 = \{aabb, abab, abba, baab, baba, bbaa\}$

$L_5 = \{\wedge, a, b, aa, ab, ba, bb\}$

$L_6 = \{a, b\}$

$L_7 = \{aa, ab, aba, bb\}$

$L_8 = \{aaa, bb\}$

c) $L_7L_8 = \{aaaaa, aabb, abaaa, abbb, abaaaa, ababb, bbaaa, bbbb\}$

$L_6L_8 = \{aaaa, abb, baaa, bbb\}$

$L_5L_8 = \{aaa, bb, aaaa, abb, baaa, bbb, aaaaa, aabb, abaaa, abbb, baaaa, babb, bbaaa, bbbb\}$

d) $L_8^0 = 0$

$L_8^1 = 0$

$L_8^2 = bb$

e) $L_7 \cap L_8 = \{bb\}$

$L_6 \cap L_8 = \{\phi\}$

$L_5 \cap L_8 = \{bb\}$

$L_1 \cap L_2 = L_2$

$L_3 \cap L_4 = \{\phi\}$

f) $L_1' = \{x \mid n_a(x) \text{ is not even}\}$

$L_2' = \{x \mid n_a(x) \neq 2 \text{ or } n_b(x) \neq 2\}$

$L_3' = \{x \mid n_a(x) \neq 0 \text{ or } n_b(x) \text{ is even}\}$

g) $L_7 \cup L_8 = \{aa, ab, aba, bb\{, aaa, bb\}$

$L_6 \cup L_8 = \{a, b, aaa, bb\}$

$L_5 \cup L_8 = \{\wedge, a, b, aa, ab, ba, bb, aaa, bb\}$

$L_1 \cup L_2 = \{\wedge, b, aa, bb, aab, aba, baa, bab, bba, bbb \ldots\}$

$L_3 \cup L_4 = \{\wedge, a, b, ab, ba, bb, aaa, aab, aba, \ldots\ldots\}$

h) $L_7 - L_8 = \{aa, ab, aba\}$

$L_6 - L_8 = L_6$

$L_4 - L_5 = \{aaa, aaab, aaba, abaa, baaa, \ldots\}$

$L_1 - L_3 = \{\hat{a}a, aaaa, aabb, abab, abba, baab, baba, bbaa, \ldots\}$