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21L-1858
BSCS-6D

Assignment-1

Q.1

$L_1 = \{ aa, aaaa, aabb, abab, baab, baba, baaaab, \ldots \}$
$L_2 = \{ aabb, abab, baab, baba, \ldots \}$
$L_3 = \{ b, bbb, bbbbb, \ldots \}$
$L_4 = \{ a, aaa, baaa, baaab, \ldots \}$
$L_5 = \{ a, b, ab, ba, aa, bb \}$
$L_6 = \{ a, b \}$
$L_7 = \{ aa, ab, aba, bb \}$
$L_8 = \{ aaa, bb \}$

a.) Finite ∃ Countable : L_2, L_5, L_6, L_7, L_8
Infinite ∃ Uncountable : L_1, L_3, L_4

b.) $L_8 : \{ aaa, bb \}$
$L_7 : \{ aa, ab, aba, bb \}$
$L_6 = \{ a, b \}$
$L_5 = \{ a, b, ab, ba, aa, bb \}$
$L_2 = \{ aabb, bbaa, abab, baba, baab, abba \}$

c.) $L_7 L_8$: $\{aa, ab, aba, bb\} . \{aaa, bb\}$

: $\{aaaaa, abaaa, abaaaa, bbaaa, aabb, abbb, ababb, bbbb\}$

$L_6 L_8$: $\{a, b\} . \{aaa, bb\}$

: $\{aaaaa, abb, baaa, bbb\}$

$L_5 L_8$: $\{a, b, ab, ba, aa, bb\} . \{aaa, bb\}$

: $\{aaaaa, abb, baaa, bbb, abaaa, abbb, baaaa, babb, aaaaaa, aabb, bbaaa, bbbb\}$

e.) $L_7 \cap L_8$: $\{bb\}$; $L_6 \cap L_8$: $\{\phi\}$

$L_5 \cap L_8$: $\{bb\}$; $L_1 \cap L_2$: $\{aabb, bbaa, abab, baba, baab, abba\}$

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

f.) $L_1 = \{x \mid n_a(x) \text{ is even}\}$

$\Downarrow$

$\overline{L_1} = \{x \mid n_a(x) \text{ is odd}\}$

$\overline{L_1} = \{a, aaa, aaaaa, \ldots\}$

$L_2 = \{x \mid n_a(x) = 2 \;\&\; n_b(x) = 2\}$

$\Downarrow$

$\overline{L_2} = \{x \mid n_a(x) \neq 2 \;\&\; n_b(x) \neq 2\}$

$\overline{L_2} = \{aaab, aaabbb, ab, \ldots\}$

$L_3 = \{x \mid n_a(x) = 0 \;\&\; n_b(x) \text{ is odd}\}$

$\Downarrow$

$\overline{L_3} = \{x \mid n_a(x) \neq 0 \;\&\; n_b(x) \text{ is even}\}$

$\overline{L_3} = \{abb, aabb, aaabb, \ldots\}$

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

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

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

$L_1 \cup L_2 : \{aabb, bbaa, abab, baba, baab, abba, aa, aaaa, \dots\}$

$L_3 \cup L_4 : \{a, b, aaa, bbb, baaa, \dots\}$

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

$L_6 - L_8 : \{a, b\}$

$L_4 - L_5 = \{aaa, baaa, baaab, \dots\}$

$L_1 - L_3 = \{aa, aaaa, aabb, abab, \dots\}$

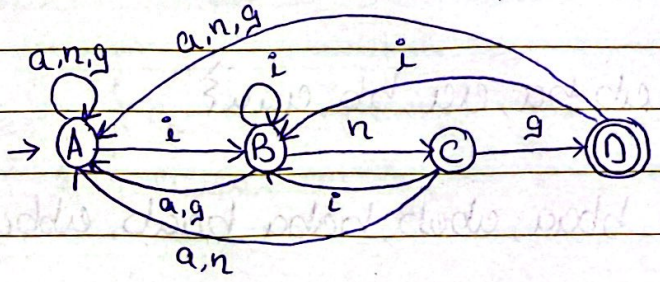
d.) $L_8^0 : \{\varepsilon\}$

$L_8^1 : \{aaa, bb\}$

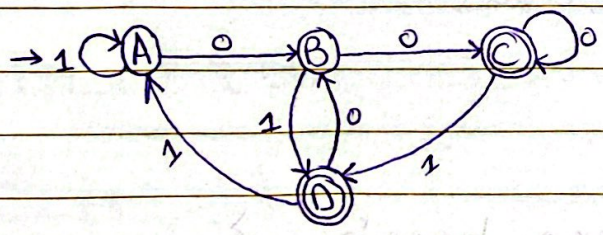
$L_8^2 : \{aaaaaa, bbbb, aaabb, bbaaa\}$

Q.2

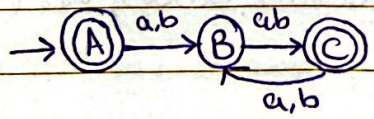
1) $L = \{ x \mid x \text{ over } \{a, i, n, g\} ; x \text{ ends with 'ing'} \}$



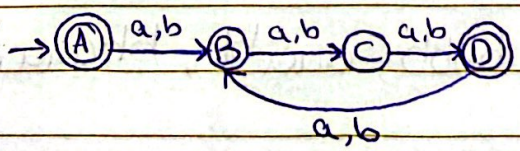
2) $L = \{ x \mid x \text{ over } \{0, 1\} ; x\text{'s 2nd last digit must be '0'} \}$



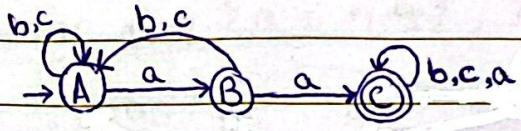
3) $L = \{ x \mid x \text{ over } \{a, b\} ; |x| \text{ is divisible by } 2 \}$



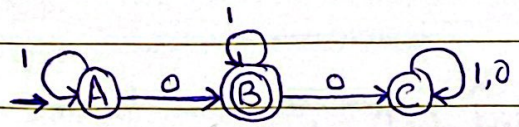
4.) $L = \{ x \mid x \text{ over } \{a, b\} ; |x| \text{ is divisible by } 3 \}$



5.) $L = \{ x | x$ over $\{a,b,c\}$; x contains "aa" as a substring $\}$

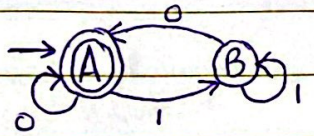


6.) $L = \{ x | x$ over $\{0,1\}$; In every 'x' of sequence 3 it contains exactly one '0' $\}$



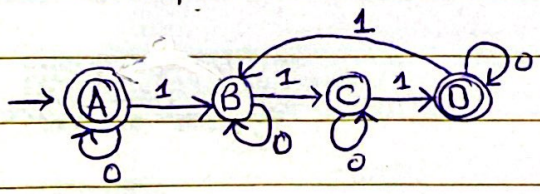
7.) $L = \{ x | x$ over $\{0,1\}$; x as decimal num divisible by 2 $\}$

9.) x as binary num div by 2



Both Questions have the same state machine diagram

8.) $L = \{ x | x$ over $\{0,1\}$; x as decimal num divisible by 3 $\}$



10.) $L = \{ x | x$ over $\{0,1\}$; x as binary num divisible by 3 $\}$