**In20-S4-CS3063 – Theory of Computing**

**Assignment 01**

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QUESTION 01

1. The regular expression for the given DFA is (0|1)\*10010(0|1)\* . In simple terms, the language L1 consists of all strings that:

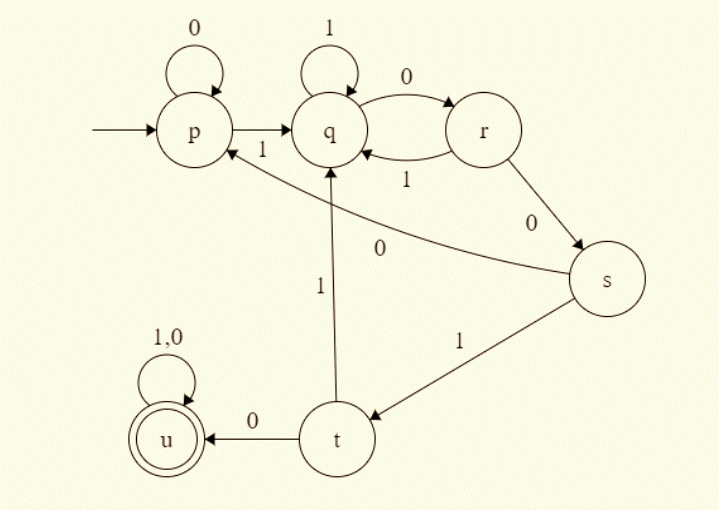
* Start with any combination of 0s and 1s including none at all, denoted by the "\*".
* Followed by the sequence "10010".
* Ends with any combination of 0s and 1s including none at all, again denoted by "\*".

So essentially L1 is a string containing the sequence "10010". For example, "10010", "0110010", "0100100110".

1. L2 contains all strings over the alphabet Σ that are not in L1. That means any string which doesn’t contain the sequence "10010".

Eg. “11010”, “110”, “11111”

1. To get the complement of a DFA we need to change the Final states to non-final states and vice-versa.



QUESTION 02

Λ

c

Λ

Λ

Λ

Λ

a

b

Λ

Λ

Λ

Λ

0

1

2

b

b

b

3

4

5

8

6

7

9

10

11

Λ

Λ

Λ

0

1

5

2

Λ

a

c

Λ

Λ

Λ

Λ

4

6

7

8

b

c

c

c

9

3

10

1. L1 ⋃ L2 = [cb+b(a|b)\*] | [(ab|c)\*c+c]

Λ

c

Λ

Λ

Λ

Λ

a

b

Λ

Λ

Λ

Λ

1

2

3

b

b

b

4

5

6

9

7

8

10

11

12

Λ

Λ

Λ

13

14

18

15

Λ

a

c

Λ

Λ

Λ

Λ

17

19

20

21

b

c

c

c

22

16

23

0

24

Λ

Λ

Λ

Λ

QUESTION 03

1. Yellow – 1st Pass

Blue – 2nd Pass

No 3rd Pass

1

2

3

4

5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| 0 |  |  |  |  |

1

2

4

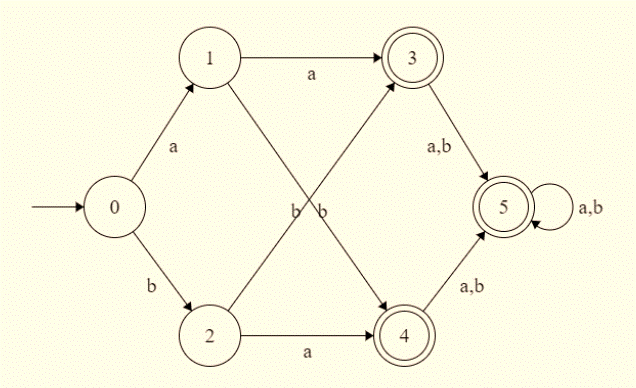
3

Equivalence Classes;

**{3,4,5}**

**{1,2}**

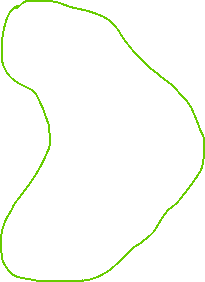
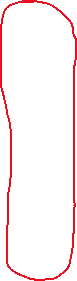
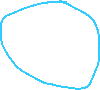
**{0}**

1. 

C3

C2

C1



Transition Diagram for minimized DFA

a,b

a,b

a,b

C3

C2

C1

1. It will accept a or b (a|b) and another a or b (a|b) and anything afterwards (a|b)\*. This means it will accept any string of length >= 2 for the given language.

**Regular Expression : (a|b)(a|b)(a|b)\* or (a|b)(a|b)+**

QUESTION 04

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| q | δ(q, Λ) | δ(q, a) | δ(q, b) | δ\*(q, a) | δ\*(q, b) |
| 0 | Ø | {1} | {3} | {1,2,3} | {1,2,3} |
| 1 | {2,3} | Ø | Ø | {1,2,3} | Ø |
| 2 | Ø | {3} | Ø | {1,2,3} | Ø |
| 3 | {1} | Ø | Ø | {1,2,3} | Ø |

a

1

a

a

a

a,b

a

a,b

2

0

a

a

a,b

a

3

a

a

a,b

0

1

|  |  |  |
| --- | --- | --- |
| q | δ\*(q, a) | δ\*(q, b) |
| {0} | {1,2,3} | {1,2,3} |
| {1,2,3} | {1,2,3} | Ø |

QUESTION 05

1. (a|bab\*a|bb)\*b

1. (a|ab+|b+ab\*)a
2. (10\*1|0)\*110

Λ

Simplified Diagram

0

Λ

1

1

Λ

0

1

1

0

Λ

QUESTION 06

1/0

INPUT / OUTPUT

0/1

1/1

0/0

1/0

0/0

1/0

0/0

1/0

0/0

D

C

E

B

A