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DOKUMENTASI TEST CASE

1. Test Case DFA

a. L1 (All strings that start with '10' and end with '01')

i. Accepted (101101101)

```
δ*(Q0, 101101101)
= δ(δ*(Q0, 10110110), 1)
= δ(δ(δ*(Q0, 1011011), 0), 1)
= δ(δ(δ(δ*(Q0, 101101), 1, 0, 1)
= δ(δ(δ(δ(δ*(Q0, 10110), 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ*(Q0, 1011), 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ*(Q0, 101), 1, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ*(Q0, 10), 1, 1, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q0, 1), 0, 1, 1, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q0, ε), 1, 0, 1, 1, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q2, 0, 1, 1, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(Q3, 1, 1, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(Q5, 1, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(Q3, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(Q4, 1, 1, 0, 1)
= δ(δ(δ(δ(Q5, 1, 0, 1)
= δ(δ(δ(Q3, 0, 1)
= δ(δ(Q4, 1)
= δ(Q5)
= Q5
Result: Accepted
```

ii. Accepted (101001101)

```
δ*(Q0, 101001101)
= δ(δ*(Q0, 10100110), 1)
= δ(δ(δ*(Q0, 1010011), 0, 1)
= δ(δ(δ(δ*(Q0, 101001), 1, 0, 1)
= δ(δ(δ(δ(δ*(Q0, 10100), 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ*(Q0, 1010), 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ*(Q0, 101), 0, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ*(Q0, 10), 1, 0, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q0, 1), 0, 1, 0, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q0, ε), 1, 0, 1, 0, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(Q2, 0, 1, 0, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(Q3, 1, 0, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(δ(δ(Q5, 0, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(δ(Q4, 0, 1, 1, 0, 1)
= δ(δ(δ(δ(δ(Q4, 1, 1, 0, 1)
= δ(δ(δ(δ(Q5, 1, 0, 1)
= δ(δ(δ(Q3, 0, 1)
= δ(δ(Q4, 1)
= δ(Q5)
= Q5
Result: Accepted
```

iii. Rejected (01000010)

```
δ*(Q0, 01000010)
= δ(δ*(Q0, 0100001), 0)
= δ(δ(δ*(Q0, 010000), 1, 0)
= δ(δ(δ(δ*(Q0, 01000), 0, 1, 0)
= δ(δ(δ(δ(δ*(Q0, 0100), 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ*(Q0, 010), 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ*(Q0, 01), 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ*(Q0, 0), 1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q0, ε), 0, 1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q1, 1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(Q1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(Q1, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(Q1, 0, 1, 0)
= δ(δ(δ(Q1, 1, 0)
= δ(Q1)
= Q1
Result: Rejected
```

iv. Rejected (101000010)

```
δ*(Q0, 101000010)
= δ(δ*(Q0, 10100001), 0)
= δ(δ(δ*(Q0, 1010000), 1, 0)
= δ(δ(δ(δ*(Q0, 101000), 0, 1, 0)
= δ(δ(δ(δ(δ*(Q0, 10100), 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ*(Q0, 1010), 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ*(Q0, 101), 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ*(Q0, 10), 1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q0, 1), 0, 1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ*(Q0, ε), 1, 0, 1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(Q2, 0, 1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(δ(δ(δ(Q3, 1, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(δ(Q5, 0, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(δ(δ(Q4, 0, 0, 0, 1, 0)
= δ(δ(δ(δ(Q4, 0, 0, 1, 0)
= δ(δ(δ(Q4, 0, 1, 0)
= δ(δ(Q5, 0)
= δ(Q4)
= Q4
Result: Rejected
```

b. L2 (All strings that contain '000' and end with '1')

i. Accepted (110001001)

```

 $\delta^*(Q_0, 110001001)$ 
=  $\delta(\delta^*(Q_0, 11000100), 1)$ 
=  $\delta(\delta(\delta^*(Q_0, 1100010), 0), 1)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 110001), 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 11000), 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1100), 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 110), 0, 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 11), 0, 0, 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 1, 0, 0, 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1, 1, 0, 0, 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1, 0, 0, 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 0, 0, 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_1, 0, 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(Q_2, 0, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(Q_3, 1, 0, 0, 1)$ 
=  $\delta(\delta(\delta(Q_4, 0, 0, 1)$ 
=  $\delta(\delta(Q_3, 0, 1)$ 
=  $\delta(Q_3, 1)$ 
=  $\delta(Q_4)$ 
=  $Q_4$ 
Result: Accepted

```

ii. Accepted (110000011)

```

 $\delta^*(Q_0, 110000011)$ 
=  $\delta(\delta^*(Q_0, 11000001), 1)$ 
=  $\delta(\delta(\delta^*(Q_0, 1100000), 1, 1)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 110000), 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 11000), 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1100), 0, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 110), 0, 0, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 11), 0, 0, 0, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 1, 0, 0, 0, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1, 1, 0, 0, 0, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1, 0, 0, 0, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_1, 0, 0, 0, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_2, 0, 0, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(Q_3, 0, 0, 1, 1)$ 
=  $\delta(\delta(\delta(Q_3, 0, 1, 1)$ 
=  $\delta(\delta(Q_3, 1, 1)$ 
=  $\delta(Q_4, 1)$ 
=  $\delta(Q_4)$ 
=  $Q_4$ 
Result: Accepted

```

iii. Rejected (11000100)

```

 $\delta^*(Q_0, 11000100)$ 
=  $\delta(\delta^*(Q_0, 1100010), 0)$ 
=  $\delta(\delta(\delta^*(Q_0, 110001), 0, 0)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 11000), 1, 0, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 1100), 0, 1, 0, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 110), 0, 0, 1, 0, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 11), 0, 0, 0, 1, 0, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 1, 0, 0, 0, 1, 0, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1, 1, 0, 0, 0, 1, 0, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_1, 1, 0, 0, 0, 1, 0, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_2, 0, 0, 0, 1, 0, 0)$ 
=  $\delta(\delta(\delta(\delta(Q_3, 0, 0, 1, 0, 0)$ 
=  $\delta(\delta(Q_4, 0, 0)$ 
=  $\delta(Q_3, 0)$ 
=  $\delta(Q_3)$ 
=  $Q_3$ 
Result: Rejected

```

iv. Rejected (11001101)

```

 $\delta^*(Q_0, 11001101)$ 
=  $\delta(\delta^*(Q_0, 1100110), 1)$ 
=  $\delta(\delta(\delta^*(Q_0, 110011), 0, 1)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 11001), 1, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 1100), 1, 1, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 110), 0, 1, 1, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 11), 0, 0, 1, 1, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 1, 0, 0, 1, 1, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1, 1, 0, 0, 1, 1, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_1, 1, 0, 0, 1, 1, 0, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_2, 0, 0, 1, 1, 0, 1)$ 
=  $\delta(\delta(\delta(Q_3, 0, 1, 1, 0, 1)$ 
=  $\delta(\delta(Q_4, 1, 1, 0, 1)$ 
=  $\delta(Q_0, 0, 1)$ 
=  $\delta(Q_0)$ 
=  $Q_0$ 
Result: Rejected

```

c. L3 (All strings that start and end with a different symbol)

i. Accepted (10101010)

```

 $\delta^*(Q_0, 10101010)$ 
=  $\delta(\delta^*(Q_0, 1010101), 0)$ 
=  $\delta(\delta(\delta^*(Q_0, 101010), 1, 0)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 10101), 0, 1, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 1010), 1, 0, 1, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 101), 0, 1, 0, 1, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 10), 1, 0, 1, 0, 1, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 0, 1, 0, 1, 0, 1, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1, 0, 1, 0, 1, 0, 1, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_3, 0, 1, 0, 1, 0, 1, 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_4, 1, 0, 1, 0, 1, 0)$ 
=  $\delta(\delta(\delta(\delta(Q_3, 0, 1, 0, 1, 0)$ 
=  $\delta(\delta(\delta(Q_4, 1, 0, 1, 0)$ 
=  $\delta(Q_3, 0)$ 
=  $\delta(Q_4)$ 
=  $Q_4$ 
Result: Accepted

```

ii. Accepted (01110111)

```

 $\delta^*(Q_0, 01110111)$ 
=  $\delta(\delta^*(Q_0, 0111011), 1)$ 
=  $\delta(\delta(\delta^*(Q_0, 011101), 1, 1)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 01110), 1, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 0111), 0, 1, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 011), 1, 0, 1, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 01), 1, 1, 0, 1, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 0), 1, 1, 1, 0, 1, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 0, 1, 1, 1, 0, 1, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_1, 1, 1, 1, 0, 1, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_2, 1, 1, 0, 1, 1, 1)$ 
=  $\delta(\delta(\delta(\delta(Q_2, 1, 0, 1, 1, 1)$ 
=  $\delta(\delta(\delta(Q_2, 0, 1, 1, 1)$ 
=  $\delta(\delta(Q_1, 1, 1, 1)$ 
=  $\delta(\delta(Q_2, 1, 1)$ 
=  $\delta(Q_2, 1)$ 
=  $Q_2$ 
Result: Accepted

```

iii. Rejected (11010111)

```

 $\delta^*(Q_0, 11010111)$ 
=  $\delta(\delta^*(Q_0, 1101011), 1)$ 
=  $\delta(\delta(\delta^*(Q_0, 110101), 1), 1)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 11010), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 1101), 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 110), 1), 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 11), 0), 1), 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 1), 0), 1), 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1), 1), 0), 1), 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_3, 1), 0), 1), 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_3, 0), 1), 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(Q_4, 1), 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(\delta(Q_3, 0), 1), 1), 1)$ 
=  $\delta(\delta(\delta(Q_4, 1), 1), 1)$ 
=  $\delta(\delta(Q_3, 1), 1)$ 
=  $\delta(Q_3, 1)$ 
=  $\delta(Q_3)$ 
=  $Q_3$ 
Result: Rejected

```

iv. Rejected (01010110)

```

 $\delta^*(Q_0, 01010110)$ 
=  $\delta(\delta^*(Q_0, 0101011), 0)$ 
=  $\delta(\delta(\delta^*(Q_0, 010101), 1), 0)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 01010), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 0101), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 010), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 01), 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 0), 1), 0), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_1, 1), 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_2, 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(Q_1, 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(Q_2, 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(Q_1, 1), 1), 0)$ 
=  $\delta(\delta(Q_2, 1), 0)$ 
=  $\delta(Q_1)$ 
=  $Q_1$ 
Result: Rejected

```

d. L4 (All strings that start and end with an identical symbol and contain '101')

i. Accepted (110101101)

```

 $\delta^*(Q_0, 110101101)$ 
=  $\delta(\delta^*(Q_0, 11010110), 1)$ 
=  $\delta(\delta(\delta^*(Q_0, 1101011), 0), 1)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 110101), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 11010), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1101), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 110), 1), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 11), 0), 1), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 1), 0), 1), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1), 1), 0), 1), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_7, 1), 0), 1), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_7, 0), 1), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_8, 1), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(Q_9, 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(Q_8, 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(Q_9, 1), 0), 1)$ 
=  $\delta(\delta(Q_9, 0), 1)$ 
=  $\delta(Q_9, 1)$ 
=  $Q_9$ 
Result: Accepted

```

iii. Rejected (111010110)

```

 $\delta^*(Q_0, 111010110)$ 
=  $\delta(\delta^*(Q_0, 11101011), 0)$ 
=  $\delta(\delta(\delta^*(Q_0, 1110101), 1), 0)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 111010), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 11101), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1110), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 111), 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 11), 1), 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 1), 1), 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1), 1), 1), 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_7, 1), 1), 0), 1), 0), 1), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_7, 1), 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_7, 0), 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(Q_8, 1), 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(Q_9, 0), 1), 1), 0)$ 
=  $\delta(\delta(\delta(Q_8, 1), 1), 0)$ 
=  $\delta(\delta(Q_9, 1), 0)$ 
=  $\delta(Q_8)$ 
=  $Q_8$ 
Result: Rejected

```

ii. Accepted (010101010)

```

 $\delta^*(Q_0, 010101010)$ 
=  $\delta(\delta^*(Q_0, 01010101), 0)$ 
=  $\delta(\delta(\delta^*(Q_0, 0101010), 1), 0)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 010101), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 01010), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 0101), 0), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 010), 1), 0), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 01), 0), 1), 0), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 0), 1), 0), 1), 0), 1), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_1, 1), 0), 1), 0), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_2, 0), 1), 0), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_3, 1), 0), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(\delta(Q_4, 0), 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(\delta(Q_5, 1), 0), 1), 0)$ 
=  $\delta(\delta(\delta(Q_4, 0), 1), 0)$ 
=  $\delta(\delta(Q_5, 1), 0)$ 
=  $\delta(Q_4, 0)$ 
=  $Q_5$ 
Result: Accepted

```

iv. Rejected (110011001)

```

 $\delta^*(Q_0, 110011001)$ 
=  $\delta(\delta^*(Q_0, 11001100), 1)$ 
=  $\delta(\delta(\delta^*(Q_0, 1100110), 0), 1)$ 
=  $\delta(\delta(\delta(\delta^*(Q_0, 110011), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta^*(Q_0, 11001), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1100), 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 110), 0), 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 11), 0), 0), 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, 1), 1), 0), 0), 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(Q_0, \epsilon), 1), 1), 0), 0), 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_7, 1), 0), 0), 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(\delta(Q_7, 0), 0), 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(\delta(Q_8, 0), 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(\delta(Q_6, 1), 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(\delta(Q_7, 1), 0), 0), 1)$ 
=  $\delta(\delta(\delta(Q_7, 0), 0), 1)$ 
=  $\delta(\delta(Q_8, 0), 1)$ 
=  $\delta(Q_6, 1)$ 
=  $Q_7$ 
Result: Rejected

```


iii. Rejected (11010111)

```
Input string: 11010111
 $\delta^*(Q_0, \epsilon) = \{Q_0\}$ 
 $\delta^*(Q_0, 1) = \delta(Q_0, 1) = \{Q_2\} = \{Q_2\}$ 
 $\delta^*(Q_0, 11) = \delta(Q_2, 1) = \{Q_2\} = \{Q_2\}$ 
 $\delta^*(Q_0, 110) = \delta(Q_2, 0) = \{Q_2, Q_3\} = \{Q_2, Q_3\}$ 
 $\delta^*(Q_0, 1101) = \delta(Q_3, 1) \cup \delta(Q_2, 1) = \{\} \cup \{Q_2\} = \{Q_2\}$ 
 $\delta^*(Q_0, 11010) = \delta(Q_2, 0) = \{Q_2, Q_3\} = \{Q_2, Q_3\}$ 
 $\delta^*(Q_0, 110101) = \delta(Q_3, 1) \cup \delta(Q_2, 1) = \{\} \cup \{Q_2\} = \{Q_2\}$ 
 $\delta^*(Q_0, 1101011) = \delta(Q_2, 1) = \{Q_2\} = \{Q_2\}$ 
 $\delta^*(Q_0, 11010111) = \delta(Q_2, 1) = \{Q_2\} = \{Q_2\}$ 
Result: Rejected
```

iv. Rejected (01010110)

```
Input string: 01010110
 $\delta^*(Q_0, \epsilon) = \{Q_0\}$ 
 $\delta^*(Q_0, 0) = \delta(Q_0, 0) = \{Q_1\} = \{Q_1\}$ 
 $\delta^*(Q_0, 01) = \delta(Q_1, 1) = \{Q_1, Q_3\} = \{Q_1, Q_3\}$ 
 $\delta^*(Q_0, 010) = \delta(Q_3, 0) \cup \delta(Q_1, 0) = \{\} \cup \{Q_1\} = \{Q_1\}$ 
 $\delta^*(Q_0, 0101) = \delta(Q_1, 1) = \{Q_1, Q_3\} = \{Q_1, Q_3\}$ 
 $\delta^*(Q_0, 01010) = \delta(Q_3, 0) \cup \delta(Q_1, 0) = \{\} \cup \{Q_1\} = \{Q_1\}$ 
 $\delta^*(Q_0, 010101) = \delta(Q_1, 1) = \{Q_1, Q_3\} = \{Q_1, Q_3\}$ 
 $\delta^*(Q_0, 0101011) = \delta(Q_3, 1) \cup \delta(Q_1, 1) = \{\} \cup \{Q_1, Q_3\} = \{Q_1, Q_3\}$ 
 $\delta^*(Q_0, 01010110) = \delta(Q_3, 0) \cup \delta(Q_1, 0) = \{\} \cup \{Q_1\} = \{Q_1\}$ 
Result: Rejected
```

d. L4 (All strings that start and end with an identical symbol and contain '101')

i. Accepted (110101101)

```
Input string: 110101101
 $\delta^*(Q_0, \epsilon) = \{Q_0\}$ 
 $\delta^*(Q_0, 1) = \delta(Q_0, 1) = \{Q_2, Q_4\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 11) = \delta(Q_2, 1) \cup \delta(Q_4, 1) = \{Q_2, Q_4\} \cup \{\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 110) = \delta(Q_2, 0) \cup \delta(Q_4, 0) = \{Q_2\} \cup \{Q_6\} = \{Q_2, Q_6\}$ 
 $\delta^*(Q_0, 1101) = \delta(Q_2, 1) \cup \delta(Q_6, 1) = \{Q_2, Q_4\} \cup \{Q_8, Q_9\} = \{Q_2, Q_4, Q_8, Q_9\}$ 
 $\delta^*(Q_0, 11010) = \delta(Q_9, 0) \cup \delta(Q_8, 0) \cup \delta(Q_2, 0) \cup \delta(Q_4, 0) = \{\} \cup \{Q_8\} \cup \{Q_2\} \cup \{Q_6\} = \{Q_2, Q_6, Q_8\}$ 
 $\delta^*(Q_0, 110101) = \delta(Q_8, 1) \cup \delta(Q_2, 1) \cup \delta(Q_6, 1) = \{Q_8, Q_9\} \cup \{Q_2, Q_4\} \cup \{Q_6, Q_9\} = \{Q_2, Q_4, Q_6, Q_8, Q_9\}$ 
 $\delta^*(Q_0, 1101011) = \delta(Q_8, 1) \cup \delta(Q_2, 1) \cup \delta(Q_6, 1) = \{Q_8, Q_9\} \cup \{Q_2, Q_4\} \cup \{Q_6, Q_9\} = \{Q_2, Q_4, Q_6, Q_8, Q_9\}$ 
 $\delta^*(Q_0, 11010110) = \delta(Q_9, 0) \cup \delta(Q_2, 0) \cup \delta(Q_4, 0) \cup \delta(Q_8, 0) = \{\} \cup \{Q_2\} \cup \{Q_6\} \cup \{Q_8\} = \{Q_2, Q_6, Q_8\}$ 
 $\delta^*(Q_0, 110101101) = \delta(Q_8, 1) \cup \delta(Q_2, 1) \cup \delta(Q_6, 1) = \{Q_8, Q_9\} \cup \{Q_2, Q_4\} \cup \{Q_6, Q_9\} = \{Q_2, Q_4, Q_6, Q_8, Q_9\}$ 
Result: Accepted
```

iii. Rejected (111010110)

```
Input string: 111010110
 $\delta^*(Q_0, \epsilon) = \{Q_0\}$ 
 $\delta^*(Q_0, 1) = \delta(Q_0, 1) = \{Q_2, Q_4\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 11) = \delta(Q_2, 1) \cup \delta(Q_4, 1) = \{Q_2, Q_4\} \cup \{\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 111) = \delta(Q_2, 1) \cup \delta(Q_4, 1) = \{Q_2, Q_4\} \cup \{\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 1110) = \delta(Q_2, 0) \cup \delta(Q_4, 0) = \{Q_2\} \cup \{Q_6\} = \{Q_2, Q_6\}$ 
 $\delta^*(Q_0, 11101) = \delta(Q_2, 1) \cup \delta(Q_6, 1) = \{Q_2, Q_4\} \cup \{Q_8, Q_9\} = \{Q_2, Q_4, Q_8, Q_9\}$ 
 $\delta^*(Q_0, 111010) = \delta(Q_9, 0) \cup \delta(Q_8, 0) \cup \delta(Q_2, 0) \cup \delta(Q_4, 0) = \{\} \cup \{Q_8\} \cup \{Q_2\} \cup \{Q_6\} = \{Q_2, Q_6, Q_8\}$ 
 $\delta^*(Q_0, 1110101) = \delta(Q_8, 1) \cup \delta(Q_2, 1) \cup \delta(Q_6, 1) = \{Q_8, Q_9\} \cup \{Q_2, Q_4\} \cup \{Q_6, Q_9\} = \{Q_2, Q_4, Q_6, Q_8, Q_9\}$ 
 $\delta^*(Q_0, 11101011) = \delta(Q_8, 1) \cup \delta(Q_2, 1) \cup \delta(Q_6, 1) = \{Q_8, Q_9\} \cup \{Q_2, Q_4\} \cup \{Q_6, Q_9\} = \{Q_2, Q_4, Q_6, Q_8, Q_9\}$ 
 $\delta^*(Q_0, 111010110) = \delta(Q_9, 0) \cup \delta(Q_2, 0) \cup \delta(Q_4, 0) \cup \delta(Q_8, 0) = \{\} \cup \{Q_2\} \cup \{Q_6\} \cup \{Q_8\} = \{Q_2, Q_6, Q_8\}$ 
Result: Rejected
```

ii. Accepted (010101010)

```
Input string: 010101010
 $\delta^*(Q_0, \epsilon) = \{Q_0\}$ 
 $\delta^*(Q_0, 0) = \delta(Q_0, 0) = \{Q_1\} = \{Q_1\}$ 
 $\delta^*(Q_0, 01) = \delta(Q_1, 1) = \{Q_1, Q_3\} = \{Q_1, Q_3\}$ 
 $\delta^*(Q_0, 010) = \delta(Q_3, 0) \cup \delta(Q_1, 0) = \{Q_5\} \cup \{Q_1\} = \{Q_1, Q_5\}$ 
 $\delta^*(Q_0, 0101) = \delta(Q_1, 1) \cup \delta(Q_5, 1) = \{Q_1, Q_3\} \cup \{Q_7\} = \{Q_1, Q_3, Q_7\}$ 
 $\delta^*(Q_0, 01010) = \delta(Q_7, 0) \cup \delta(Q_3, 0) \cup \delta(Q_1, 0) = \{Q_7, Q_9\} \cup \{Q_5\} \cup \{Q_1\} = \{Q_1, Q_5, Q_7, Q_9\}$ 
 $\delta^*(Q_0, 010101) = \delta(Q_9, 1) \cup \delta(Q_7, 1) \cup \delta(Q_1, 1) \cup \delta(Q_5, 1) = \{\} \cup \{Q_7\} \cup \{Q_1, Q_3\} \cup \{Q_7\} = \{Q_1, Q_3, Q_7, Q_9\}$ 
 $\delta^*(Q_0, 0101010) = \delta(Q_9, 0) \cup \delta(Q_1, 0) \cup \delta(Q_3, 0) = \{Q_7, Q_9\} \cup \{Q_5\} = \{Q_1, Q_5, Q_7, Q_9\}$ 
 $\delta^*(Q_0, 01010101) = \delta(Q_9, 1) \cup \delta(Q_7, 1) \cup \delta(Q_5, 1) \cup \delta(Q_1, 1) = \{\} \cup \{Q_7\} \cup \{Q_7\} \cup \{Q_1, Q_3\} = \{Q_1, Q_3, Q_7, Q_9\}$ 
 $\delta^*(Q_0, 010101010) = \delta(Q_9, 0) \cup \delta(Q_1, 0) \cup \delta(Q_3, 0) = \{Q_7, Q_9\} \cup \{Q_5\} = \{Q_1, Q_5, Q_7, Q_9\}$ 
Result: Accepted
```

iv. Rejected (110011001)

```
Input string: 110011001
 $\delta^*(Q_0, \epsilon) = \{Q_0\}$ 
 $\delta^*(Q_0, 1) = \delta(Q_0, 1) = \{Q_2, Q_4\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 11) = \delta(Q_2, 1) \cup \delta(Q_4, 1) = \{Q_2, Q_4\} \cup \{\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 110) = \delta(Q_2, 0) \cup \delta(Q_4, 0) = \{Q_2\} \cup \{Q_6\} = \{Q_2, Q_6\}$ 
 $\delta^*(Q_0, 1100) = \delta(Q_2, 0) \cup \delta(Q_6, 0) = \{Q_2\} \cup \{\} = \{Q_2\}$ 
 $\delta^*(Q_0, 11001) = \delta(Q_2, 1) = \{Q_2, Q_4\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 110011) = \delta(Q_2, 1) \cup \delta(Q_4, 1) = \{Q_2, Q_4\} \cup \{\} = \{Q_2, Q_4\}$ 
 $\delta^*(Q_0, 1100110) = \delta(Q_2, 0) \cup \delta(Q_4, 0) = \{Q_2\} \cup \{Q_6\} = \{Q_2, Q_6\}$ 
 $\delta^*(Q_0, 11001100) = \delta(Q_2, 0) \cup \delta(Q_6, 0) = \{Q_2\} \cup \{\} = \{Q_2\}$ 
 $\delta^*(Q_0, 110011001) = \delta(Q_2, 1) = \{Q_2, Q_4\} = \{Q_2, Q_4\}$ 
Result: Rejected
```