

APP_Exercise 8

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AUTOMATA PROGRAMMING:

DFA

1.

```
from automata.fa.dfa import DFA dfa = DFA(  
states={'q0', 'q1', 'q2', 'q3'}, input_symbols={'0', '1'},  
transitions={  
  
'q0': {'0': 'q1', '1': 'q0'}, 'q1': {'0': 'q2', '1': 'q0'}, 'q2': {'0': 'q2', '1':  
'q3'}, 'q3': {'0': 'q3', '1': 'q3'}  
  
}, initial_state='q0', final_states={'q3'})  
  
for i in range(1,4):  
..  
  
num = input("Enter the string :") if(dfa.accepts_input(num)):  
print("Accepted") else:  
print("Rejected") 2.
```

```
from automata.fa.dfa import DFA dfa = DFA(  
states={'q0', 'q1', 'q2'}, input_symbols={'0', '1'}, transitions={  
  
'q0': {'0': 'q0', '1': 'q1'}, 'q1': {'0': 'q1', '1': 'q2'}, 'q2': {'0': 'q2', '1':  
'q1'}
```

```

}, initial_state='q0', final_states={'q2'}
)
for i in range(1,4):
num = input("Enter the string :") if(dfa.accepts_input(num)):
print("Accepted")
..
else: print("Rejected")

```

3.

```

from automata.fa.dfa import DFA dfa = DFA(
states={'q0'}, input_symbols={'0', '1'}, transitions={
'q0': {'0': 'q0', '1': 'q0'} },
initial_state='q0',
final_states={'q0'} )
for i in range(1,8):
num = input("Enter the string :") if(dfa.accepts_input(num)):
print("Accepted") else:
print("Rejected") 4.

```

```

from automata.fa.dfa import DFA dfa = DFA(
..
states={'q0', 'q1', 'q2', 'q3', 'q4', 'q5'}, input_symbols={'a', 'b'},
transitions={

```

```
'q0': {'a': 'q1', 'b': 'q5'}, 'q1': {'a': 'q2', 'b': 'q5'}, 'q2': {'a': 'q3', 'b':  
'q4'}, 'q3': {'a': 'q2', 'b': 'q5'}, 'q4': {'a': 'q5', 'b': 'q5'}, 'q5': {'a':  
'q5', 'b': 'q5'}
```

```
},
```

```
initial_state='q0', final_states={'q1', 'q4'}
```

```
)
```

```
for i in range(1,6):
```

```
num = input("Enter the string :") if(dfa.accepts_input(num)):
```

```
print("Accepted") else:
```

```
print("Rejected")
```

```
..
```

5.

```
from automata.fa.dfa import DFA dfa = DFA(
```

```
states={'q0', 'q1', 'q2', 'q3'}, input_symbols={'a', 'b'},
```

```
transitions={
```

```
'q0': {'a': 'q1', 'b': 'q3'}, 'q1': {'a': 'q3', 'b': 'q2'}, 'q2': {'a': 'q1', 'b':  
'q3'}, 'q3': {'a': 'q3', 'b': 'q3'}
```

```
}, initial_state='q0', final_states={'q2'}
```

```
)
```

```
for i in range(1,6):
```

```
num = input("Enter the string :") if(dfa.accepts_input(num)):
```

```
print("Accepted") else:
```

```
print("Rejected"
```

```
..
```

6.a.

```
from automata.fa.dfa import DFA dfa = DFA(  
states={'q0', 'q1'}, input_symbols={'0', '1'}, transitions={  
'q0': {'0': 'q0', '1': 'q0'},  
'q1': {'0': 'q1', '1': 'q1'} },  
initial_state='q0',  
final_states={'q1'} )  
  
for i in range(1,8):  
num = input("Enter the string :") if(dfa.accepts_input(num)):  
print("Accepted") else:  
print("Rejected")  
..
```

6.b

```
from automata.fa.dfa import DFA dfa = DFA(  
states={'q0', 'q1'}, input_symbols={'0', '1'}, transitions={  
'q0': {'0': 'q1', '1': 'q1'},  
'q1': {'0': 'q1', '1': 'q1'} },  
initial_state='q0',  
final_states={'q0'} )  
  
for i in range(1,6):  
num = input("Enter the string :") if(dfa.accepts_input(num)):  
print("Accepted") else:
```

```
print("Rejected")
```

```
..
```

6.c

```
from automata.fa.dfa import DFA dfa = DFA(  
states={'q0'}, input_symbols={'0', '1'}, transitions={  
'q0': {'0': 'q0', '1': 'q0'} },  
initial_state='q0',  
final_states={'q0'} )  
  
for i in range(1,8):  
num = input("Enter the string :") if(dfa.accepts_input(num)):  
print("Accepted") else:  
print("Rejected")
```

```
..
```

6.d

```
from automata.fa.dfa import DFA dfa = DFA(  
states={'q0', 'q1'}, input_symbols={'0', '1'}, transitions={  
'q0': {'0': 'q1', '1': 'q1'},  
'q1': {'0': 'q1', '1': 'q1'} },  
initial_state='q0',  
final_states={'q1'} )  
  
for i in range(1,8):  
num = input("Enter the string :") if(dfa.accepts_input(num)):
```

```
print("Accepted") else:
```

```
print("Rejected")
```

```
..
```

NFA

1.

```
from automata.fa.nfa import NFA nfa = NFA(
```

```
states={'q0', 'q1', 'q2'}, input_symbols={'0', '1'}, transitions={
```

```
'q0': {'0': {'q1','q0'}, '1': {'q0'}}, 'q1': {'1': {'q2'}},
```

```
'q2': {}
```

```
}, initial_state='q0', final_states={'q2'}
```

```
)
```

```
for i in range(1,4):
```

```
num = input("Enter the string :") if(nfa.accepts_input(num)):
```

```
print("Accepted") else:
```

```
print("Rejected")
```

```
..
```

2.

```
from automata.fa.nfa import NFA nfa = NFA(
```

```
states={'q0', 'q1', 'q2', 'q3', 'q4'}, input_symbols={'a', 'b'},
```

```
transitions={
```

```
'q0': {'a': {'q1','q2'}},
```

```
'q1': {'a': {'q2','q4'}, 'b': {'q4'}}, 'q2': {'a': {'q2'}, 'b': {'q3'}}, 'q3':
```

```
{},
```

```
'q4': {}
```

```

},
initial_state='q0', final_states={'q1','q3'}

)
for i in range(1,6):

num = input("Enter the string :") if(nfa.accepts_input(num)):
print("Accepted") else:
print("Rejected")

..

```

```

3.
from automata.fa.nfa import NFA nfa = NFA(

states={'q0', 'q1', 'q2'}, input_symbols={'a', 'b'}, transitions={

'q0': {'a': {'q1'}}},
'q1': {'b': {'q0', 'q2'}}}, 'q2': {}

}, initial_state='q0', final_states={'q2'}

)
for i in range(1,8):

num = input("Enter the string :") if(nfa.accepts_input(num)):
print("Accepted") else:
print("Rejected")

..

```

Output Screenshots:

```
In [1]: #1st
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0', 'q1', 'q2', 'q3'},
    input_symbols={'0', '1'},
    transitions={
        'q0': {'0': 'q1', '1': 'q0'},
        'q1': {'0': 'q2', '1': 'q0'},
        'q2': {'0': 'q2', '1': 'q3'},
        'q3': {'0': 'q3', '1': 'q3'}
    },
    initial_state='q0',
    final_states={'q3'}
)
for i in range(1,4):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :0001
Accepted
Enter the string :1001
Accepted
Enter the string :1011
Rejected
```

```
In [2]: #2nd
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0', 'q1', 'q2'}.
```

```
In [2]: #2nd
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0', 'q1', 'q2'},
    input_symbols={'0', '1'},
    transitions={
        'q0': {'0': 'q0', '1': 'q1'},
        'q1': {'0': 'q1', '1': 'q2'},
        'q2': {'0': 'q2', '1': 'q1'}
    },
    initial_state='q0',
    final_states={'q2'}
)
for i in range(1,4):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :1111
Accepted
Enter the string :0101
Accepted
Enter the string :1110
Rejected
```

```
In [3]: #3rd
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0'},
```

..


```
In [3]: #3rd
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0'},
    input_symbols={'0', '1'},
    transitions={
        'q0': {'0': 'q0', '1': 'q0'}
    },
    initial_state='q0',
    final_states={'q0'}
)
for i in range(1,8):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :01
Accepted
Enter the string :001
Accepted
Enter the string :0
Accepted
Enter the string :0011
Accepted
Enter the string :1001
Accepted
Enter the string :011
Accepted
Enter the string :10011
Accepted
```

```
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0', 'q1', 'q2', 'q3', 'q4', 'q5'},
    input_symbols={'a', 'b'},
    transitions={
        'q0': {'a': 'q1', 'b': 'q5'},
        'q1': {'a': 'q2', 'b': 'q5'},
        'q2': {'a': 'q3', 'b': 'q4'},
        'q3': {'a': 'q2', 'b': 'q5'},
        'q4': {'a': 'q5', 'b': 'q5'},
        'q5': {'a': 'q5', 'b': 'q5'}
    },
    initial_state='q0',
    final_states={'q1', 'q4'}
)
for i in range(1,6):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :a
Accepted
Enter the string :ab
Rejected
Enter the string :aab
Accepted
Enter the string :aaaab
Accepted
Enter the string :baaaab
Rejected
```

• •

rejected

```
In [5]: #5th
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0', 'q1', 'q2', 'q3'},
    input_symbols={'a', 'b'},
    transitions={
        'q0': {'a': 'q1', 'b': 'q3'},
        'q1': {'a': 'q3', 'b': 'q2'},
        'q2': {'a': 'q1', 'b': 'q3'},
        'q3': {'a': 'q3', 'b': 'q3'}
    },
    initial_state='q0',
    final_states={'q2'}
)
for i in range(1,6):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :ab
Accepted
Enter the string :abab
Accepted
Enter the string :baba
Rejected
Enter the string :aaabbb
Rejected
Enter the string :ababab
Accepted
```

```
In [6]: #6.1
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0', 'q1'},
    input_symbols={'0', '1'},
    transitions={
        'q0': {'0': 'q0', '1': 'q0'},
        'q1': {'0': 'q1', '1': 'q1'}
    },
    initial_state='q0',
    final_states={'q1'}
)
for i in range(1,8):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :1
Rejected
Enter the string :01
Rejected
Enter the string :
Rejected
Enter the string :001
Rejected
Enter the string :00011
Rejected
Enter the string :00011
Rejected
Enter the string :0011
Rejected
```

• •

In [7]:

```
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0', 'q1'},
    input_symbols={'0', '1'},
    transitions={
        'q0': {'0': 'q1', '1': 'q1'},
        'q1': {'0': 'q1', '1': 'q1'}
    },
    initial_state='q0',
    final_states={'q0'}
)
for i in range(1,6):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :00
Rejected
Enter the string :101
Rejected
Enter the string :1011
Rejected
Enter the string :
Accepted
Enter the string :100101
Rejected
```

In [8]:

```
#6.3
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0'},
    input_symbols={'0', '1'},
    transitions={
        'q0': {'0': 'q0', '1': 'q0'}
    },
    initial_state='q0',
    final_states={'q0'}
)
for i in range(1,8):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :00
Accepted
Enter the string :011
Accepted
Enter the string :101
Accepted
Enter the string :
Accepted
Enter the string :11010
Accepted
Enter the string :1100
Accepted
Enter the string :001
Accepted
```

..

```
In [9]: #0.4
from automata.fa.dfa import DFA
dfa = DFA(
    states={'q0', 'q1'},
    input_symbols={'0', '1'},
    transitions={
        'q0': {'0': 'q1', '1': 'q1'},
        'q1': {'0': 'q1', '1': 'q1'}
    },
    initial_state='q0',
    final_states={'q1'}
)
for i in range(1,8):
    num = input("Enter the string :")
    if(dfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :
Rejected
Enter the string :01
Accepted
Enter the string :1001
Accepted
Enter the string :1101
Accepted
Enter the string :1111
Accepted
Enter the string :0
Accepted
Enter the string :01
Accepted
```

```
In [4]: from automata.fa.nfa import NFA
nfa = NFA(
    states={'q0', 'q1', 'q2'},
    input_symbols={'0', '1'},
    transitions={
        'q0': {'0': {'q1', 'q0'}, '1': {'q0'}},
        'q1': {'1': {'q2'}},
        'q2': {}
    },
    initial_state='q0',
    final_states={'q2'}
)
for i in range(1,4):
    num = input("Enter the string :")
    if(nfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")
```

```
Enter the string :0101
Accepted
Enter the string :0001
Accepted
Enter the string :0111
Rejected
```

• •

```

In [2]: from automata.fa.nfa import NFA
nfa = NFA(
    states={'q0', 'q1', 'q2', 'q3', 'q4'},
    input_symbols={'a', 'b'},
    transitions={
        'q0': {'a': {'q1', 'q2'}},
        'q1': {'a': {'q2', 'q4'}, 'b': {'q4'}},
        'q2': {'a': {'q2'}, 'b': {'q3'}},
        'q3': {},
        'q4': {}
    },
    initial_state='q0',
    final_states={'q1', 'q3'}
)
for i in range(1,6):
    num = input("Enter the string :")
    if(nfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")

```

```

Enter the string :a
Accepted
Enter the string :ab
Accepted
Enter the string :aab
Accepted
Enter the string :abab
Rejected

```

```

In [3]: from automata.fa.nfa import NFA
nfa = NFA(
    states={'q0', 'q1', 'q2'},
    input_symbols={'a', 'b'},
    transitions={
        'q0': {'a': {'q1'}},
        'q1': {'b': {'q0', 'q2'}},
        'q2': {}
    },
    initial_state='q0',
    final_states={'q2'}
)
for i in range(1,8):
    num = input("Enter the string :")
    if(nfa.accepts_input(num)):
        print("Accepted")
    else:
        print("Rejected")

```

```

Enter the string :ab
Accepted
Enter the string :abab
Accepted
Enter the string :ababab
Accepted
Enter the string :aabbb
Rejected
Enter the string :aaa
Rejected
Enter the string :baba

```