

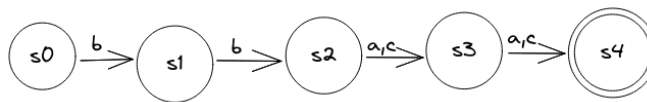
Assignment Three

Lizzy Hunt

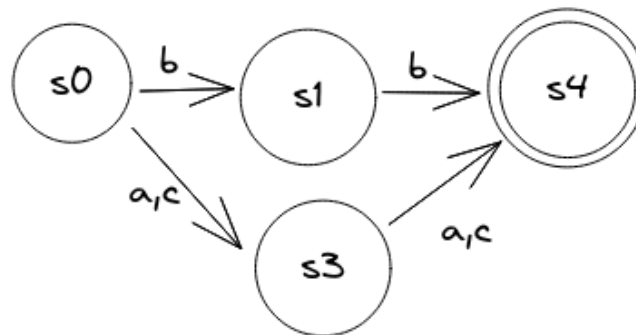
February 13, 2023

1 Question One

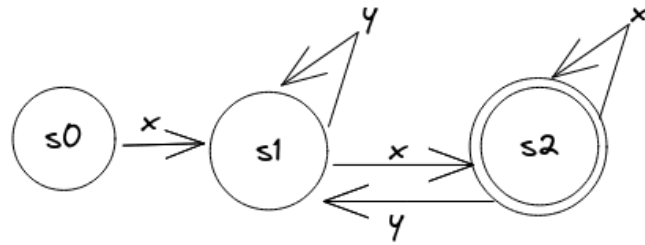
1.1 a



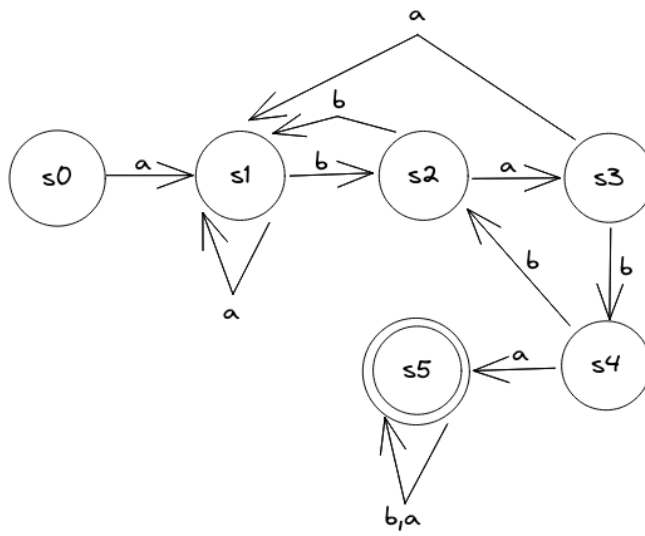
1.2 b



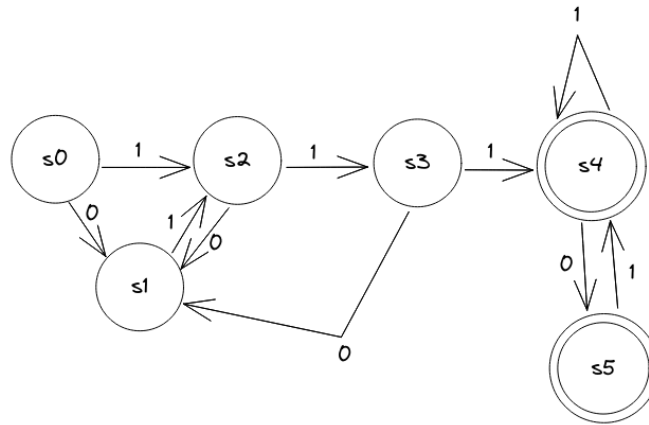
1.3 c



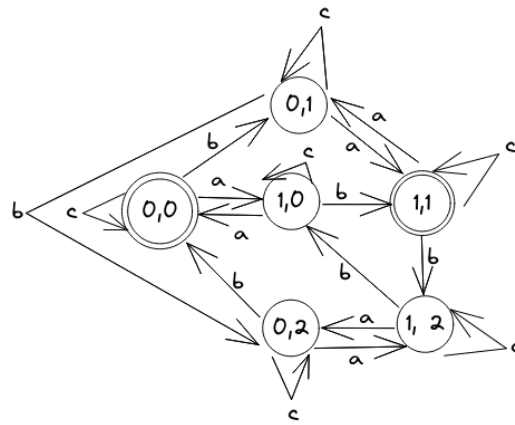
1.4 d



1.5 e



1.6 f



2 Question Two

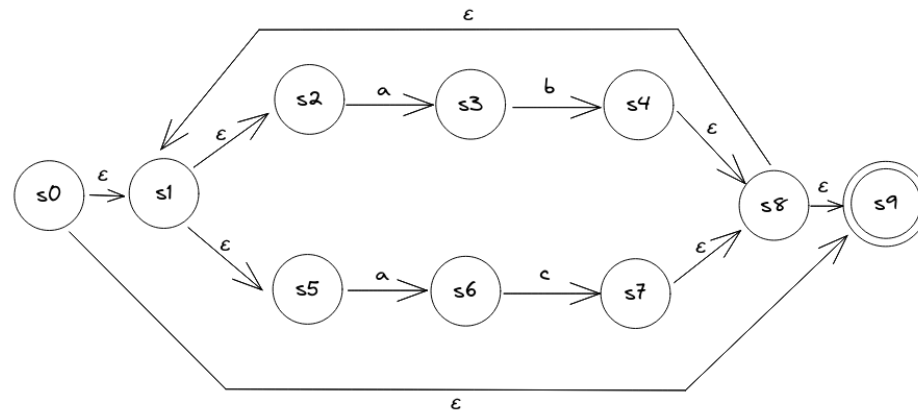
State	a	b	e
0	ϕ	ϕ	$\{1, 3\}$
1	$\{2, 4\}$	$\{4\}$	ϕ
2	$\{2\}$	ϕ	ϕ
3	ϕ	$\{4\}$	ϕ
4	ϕ	$\{4\}$	ϕ

3 Question Three

State	a	b
0	1	0
1	1	2
2	1	3
3	1	0

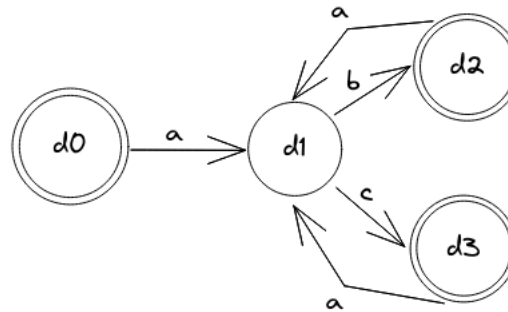
4 Question Four

4.1 a



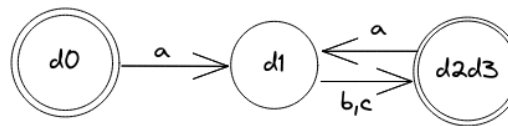
4.2 b

DFA State	NFA States	a	b	c
d_0	$\{s_0, s_1, s_2, s_5, s_9\}$	$\{s_3, s_6\} (d_1)$	s_e	s_e
d_1	$\{s_3, s_6\}$	s_e	$\{s_4, s_8, s_9, s_1, s_2, s_5\} (d_2)$	$\{s_7, s_8, s_9, s_1, s_2, s_5\} (d_3)$
d_2	$\{s_4, s_8, s_9, s_1, s_2, s_5\}$	$\{s_3, s_6\} (d_1)$	s_e	s_e
d_3	$\{s_7, s_8, s_9, s_1, s_2, s_5\}$	$\{s_3, s_6\} (d_1)$	s_e	s_e



4.3 c

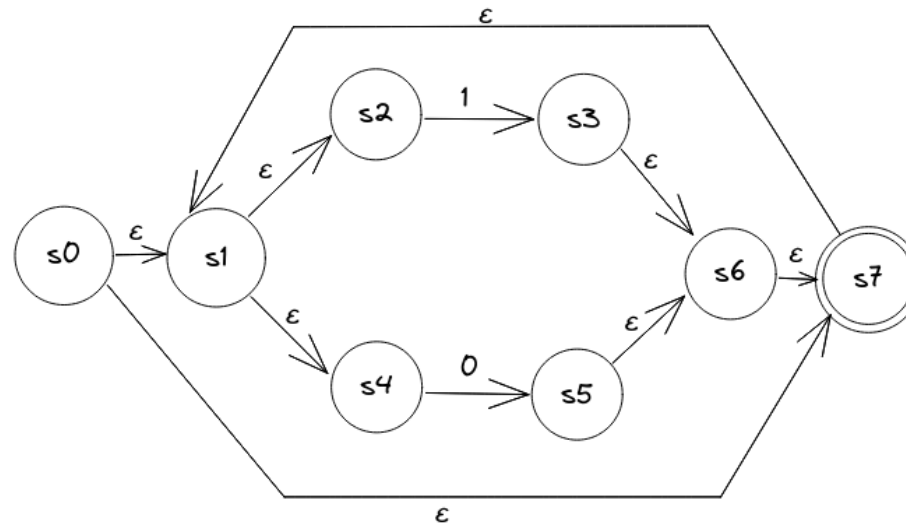
partition	a	b	c
$\{d_1\}, \{d_0, d_2, d_3\}$	$\{d_0, d_2, d_3\} \Rightarrow \{d_1, d_0, d_0\}$	$\{d_0, d_2, d_3\} \Rightarrow \{-, -, -\}$	$\{d_0, d_2, d_3\} \Rightarrow \{-, -, -\}$
$\{d_1\}, \{d_0\}, \{d_2, d_3\}$	$\{d_2, d_3\} \Rightarrow \{d_0, d_0\}$	$\{d_2, d_3\} \Rightarrow \{-, -\}$	$\{d_2, d_3\} \Rightarrow \{-, -\}$



5 Question Five

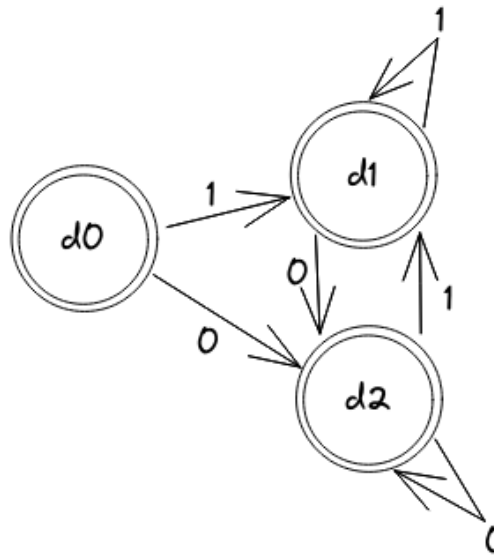
5.1 regex 1

5.1.1 NFA



5.1.2 DFA

DFA State	NFA States	1	0
d ₀	{s ₀ , s ₁ , s ₂ , s ₄ , s ₇ }	{s ₁ , s ₂ , s ₃ , s ₄ , s ₆ , s ₇ } (d ₁)	{s ₁ , s ₂ , s ₄ , s ₅ , s ₆ , s ₇ } (d ₂)
d ₁	{s ₁ , s ₂ , s ₃ , s ₄ , s ₆ , s ₇ }	d ₁	d ₂
d ₂	{s ₁ , s ₂ , s ₄ , s ₅ , s ₆ , s ₇ }	d ₁	d ₂



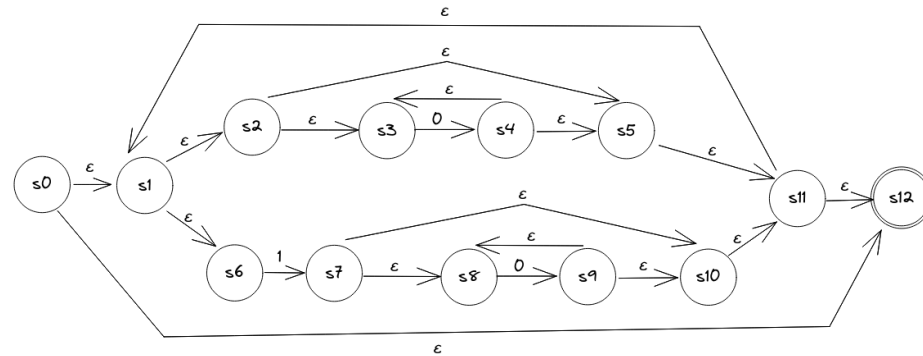
5.1.3 Minimization

partition
 $\{d_0, d_1, d_2\}$ $\{d_0, d_1, d_2\} \Rightarrow \{d_1, d_1, d_1\}$ $\{d_0, d_1, d_2\} \Rightarrow \{d_2, d_2, d_2\}$



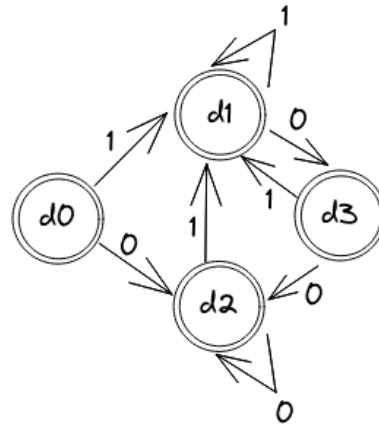
5.2 regex 2

5.2.1 NFA



5.2.2 DFA

DFA State	NFA States	1	0
d ₀	{s ₀ , s ₁ , s ₂ , s ₃ , s ₅ , s ₁₁ , s ₆ , s ₁₂ }	{s ₁ , s ₂ , s ₃ , s ₅ , s ₆ , s ₇ , s ₈ , s ₁₀ , s ₁₁ , s ₁₂ } (d ₁)	{s ₁ , s ₂ , s ₃ , s ₄ , s ₅ , s ₁₁ , s ₆ , s ₁₂ } (d ₂)
d ₁	{s ₁ , s ₂ , s ₃ , s ₅ , s ₆ , s ₇ , s ₈ , s ₁₀ , s ₁₁ , s ₁₂ }	d ₁	{s ₁ , s ₂ , s ₃ , s ₄ , s ₅ , s ₉ , s ₁₁ , s ₆ , s ₁₂ } (d ₃)
d ₂	{s ₁ , s ₂ , s ₃ , s ₄ , s ₅ , s ₁₁ , s ₆ }	d ₁	d ₂
d ₃	{s ₁ , s ₂ , s ₃ , s ₄ , s ₅ , s ₉ , s ₁₁ , s ₆ , s ₁₂ }	d ₁	d ₂



5.2.3 Minimization

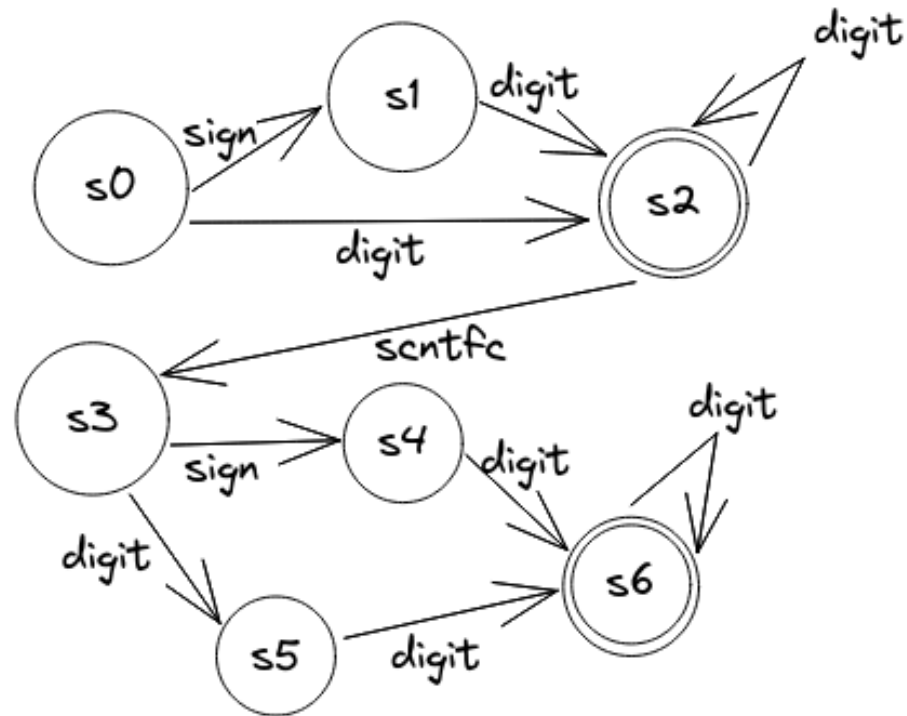
partition
 $\{d_0, d_1, d_2, d_3\} \quad \{d_0, d_1, d_2, d_3\} \Rightarrow \{d_1, d_1, d_1, d_1\} \quad \{d_0, d_1, d_2, d_3\} \Rightarrow \{d_2, d_3, d_2, d_2\}$



6 Question Six

6.1 a

6.1.1 DFA



6.1.2 catMap

```
{  
  '-': 'sign',  
  '+': 'sign',  
  [0-9]: 'digit',  
  'e': 'scntfc'
```

```
}
```

6.1.3 transMap

```
{
  's0': {
    'sign': 's1',
    'digit': 's2',
  },
  's1': {
    'digit': 's2',
  },
  's2': {
    'digit': 's2',
    'scntfc': 's3',
  },
  's3': {
    'sign': 's4',
    'digit': 's5',
  },
  's4': {
    'digit': 's6',
  },
  's5': {
    'digit': 's6',
  },
  's6': {
    'digit': 's6',
  },
}
```

6.1.4 tokenTypes

```
{
```

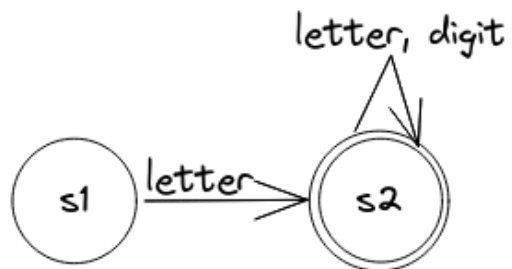
```

's2': 'integer',
's6': 'integer',
}

```

6.2 b

6.2.1 DFA



6.2.2 catMap

```

{
  [a-zA-Z]: 'letter',
  '_': 'letter',
  [0-9]: 'digit',
}

```

6.2.3 transMap

```

{
  's1': {
    'letter': 's2'
  },
  's2': {
    'letter': 's2',
    'digit': 's2',
  }
}

```

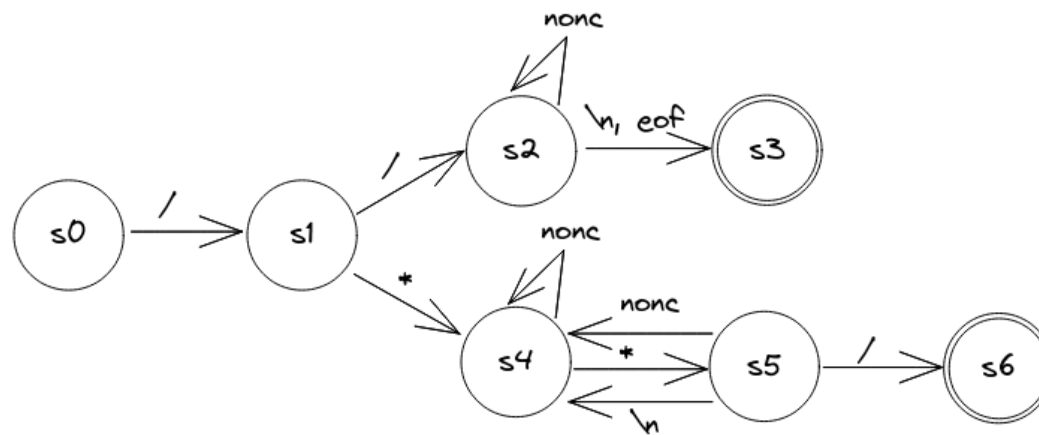
```

},
}

```

6.3 c

6.3.1 DFA



6.3.2 catMap

```

{
  [^(\n)* /]: 'nonc',
  '\n': 'newline',
  'eof': 'eof',
  '/': 'slash',
  '*': 'star'
}

```

6.3.3 transMap

```

{

```

```

's0': {
  'slash': 's1',
},
's1': {
  'slash': 's2',
  'star': 's4',
},
's2': {
  'nonc': 's2',
  'newline': 's3',
  'eof': 's3'
},
's4': {
  'nonc': 's4',
  'star': 's5',
},
's5': {
  'nonc': 's4',
  'newline': 's4',
  'slash': 's6'
}
}

```

6.3.4 tokenType

```

{
  's3': 'singleLineComment',
  's6': 'multiLineComment',
}

```