Exercise 4 – ε-NFAs

ε-NFAs[1] refer to an extension of NFAs where transitions between states can include, besides alphabet symbols, the empty string (ε). These transitions are called spontaneous transitions as they can be followed without consuming/processing input symbols.

Consider the ε-NFA shown below, where C represents any character in the alphabet (a-z) and D any digit (0-9).

	ε	C	D	@	.
→p	{q,r}	∅	∅	∅	∅
q	∅	{q,s}	∅	∅	∅
r	∅	∅	{r,s}	∅	∅
s	∅	{s}	{s}	{t}	∅
t	∅	{u}	∅	∅	∅
u	∅	{u}	∅	∅	{v}
v	∅	{v,w}	∅	∅	∅
*w	{u}	{w}	∅	∅	∅

a) What do you think is the intention of this ε-NFA?
b) Based on the number of states of this ε-NFA what is the maximum number of states that an equivalent DFA may have?
c) Convert this ε-NFA in an equivalent DFA using the subset construction technique. Draw the resulting state diagram of the DFA.

[1] Many authors simply call them as NFAs.