CS 361– Homework 8

Total possible points: 45

1. (15 points) Create a decider TM_1 for the following language
   END_{DFA} = {<D, s> | D is a DFA and accepts at least one string that ends on symbol s}

On input string <D, s>
TM_1 checks whether <D, s> is a valid encoding of a DFA and string s
If invalid then
    TM_1 rejects <D, s>
Else if DFA's alphabet does not contain symbol s
    TM_1 rejects <D, s>
Else
    TM_1 marks the state which can be reachable to D
    If the marked state is the final state
        If D accepts symbol s
            TM_1 accepts <D, s>
        Else
            TM_1 rejects <D, s>
        End if
    End if
End if

2. (15 points) Create a decider TM_2 for the following language
   $3SIZE_{DFA}$ = { <D> | D is a DFA and |L(D)| = 3}
   Recall that L(D) denotes the language of the machine D.

On input string <D, s>
TM_2 checks whether <D, s> is a valid encoding of a DFA and string s
If invalid then
    TM_2 rejects <D, s>
Else
    TM_2 simulates D on string s
    Integer i is set to 0
    If D accepts string s then
        TM_2 accepts <D, s>
        Increment value of integer i by 1
    End if
End if

If integer i is equal to 3

```
        TM2 accepts <D>
Else if i is not equal to 3
        TM2 accepts <D>
End if
```

3. (15 points) Create a decider TM_3 for the following language
   3StepsTM = {<T> | T is a TM and rejects the empty string within 3 steps, i.e., transitions}

```
On input string <T>
TM3 checks whether <T> is a valid encoding of TM and string s
If invalid then
        TM3 rejects <T>
Else if T
        For all i in {1, 2, 3}
                TM3 simulates T on string s
        End for
        TM3 rejects <T>
End if
```