Formal Model and Verification

Exercise 5: Finite state machines

** In the following, we assume finite-state models are non-halting and do not have a final state. Please draw the finite-state models with our model editor in REDLIB Sourceforge webpage.

1. Please draw a finite-state model for the following vending machine M that accepts nickels, dimes, and quarters. M accepts changes until 35 cents has been put in. It gives changes back for any amount greater than 35 cents. Then the customer can push buttons to receive a cola, a root beer, or a ginger ale.

2. Please draw a finite-state model M that reads in an infinite bit string from the least significant bit. M outputs 1 if the bit string read in so far is divisible by 3; and 0 otherwise.

3. Please answer the meaning of the following expressions in the state of s:(a=3, b=10, c=5)

a. ⟨a+3*b*c,s⟩=

b. ⟨a+3*b==c,s⟩=

c. ⟨a+b*b>c,s⟩=

d. ⟨(a+b*b>c)?a+b:b+c,s⟩=

e. ⟨(a+b*b>c)?((a<=c+b)?a+b:9):b+c,s⟩ =

4. Please construct expressions that match the meaning in s in the following interpretation.

a. ⟨¬ ,s⟩= *false*

b. ⟨ ≠ ,s⟩= *true*

c. ⟨ ∧ ,s⟩= *true*

d. ⟨ ∨ ,s⟩= *false*

e. ⟨ ≤ ,s⟩= *false*

f. ⟨ > ,s⟩= *false*

g. ⟨ ∧¬ ,s⟩= *true*

h. ⟨ ≠ ∧¬ ,s⟩= *true*

i. ⟨ → ,s⟩ = *false*

j. ⟨ ∨¬ ,s⟩= *true*

k. ⟨ →¬ ,s⟩= *true*

5. Please answer the meaning of the following commands in the state of s:(a=3, b=10, c=5)

a. ⟨a=a+b; , s⟩ =

b. ⟨b=a+3*b; a=c; c=3*c, s⟩=

c. ⟨if(a+b*b>c)a=(a<3)?b:c; else b=b+c;, s⟩=

d. ⟨while(a+b*b>c)a=a-c,s⟩ =

e. ⟨while(a+b*b=>c){ a=a-b; b=b-c;}, s⟩ =