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CS 360 - 002
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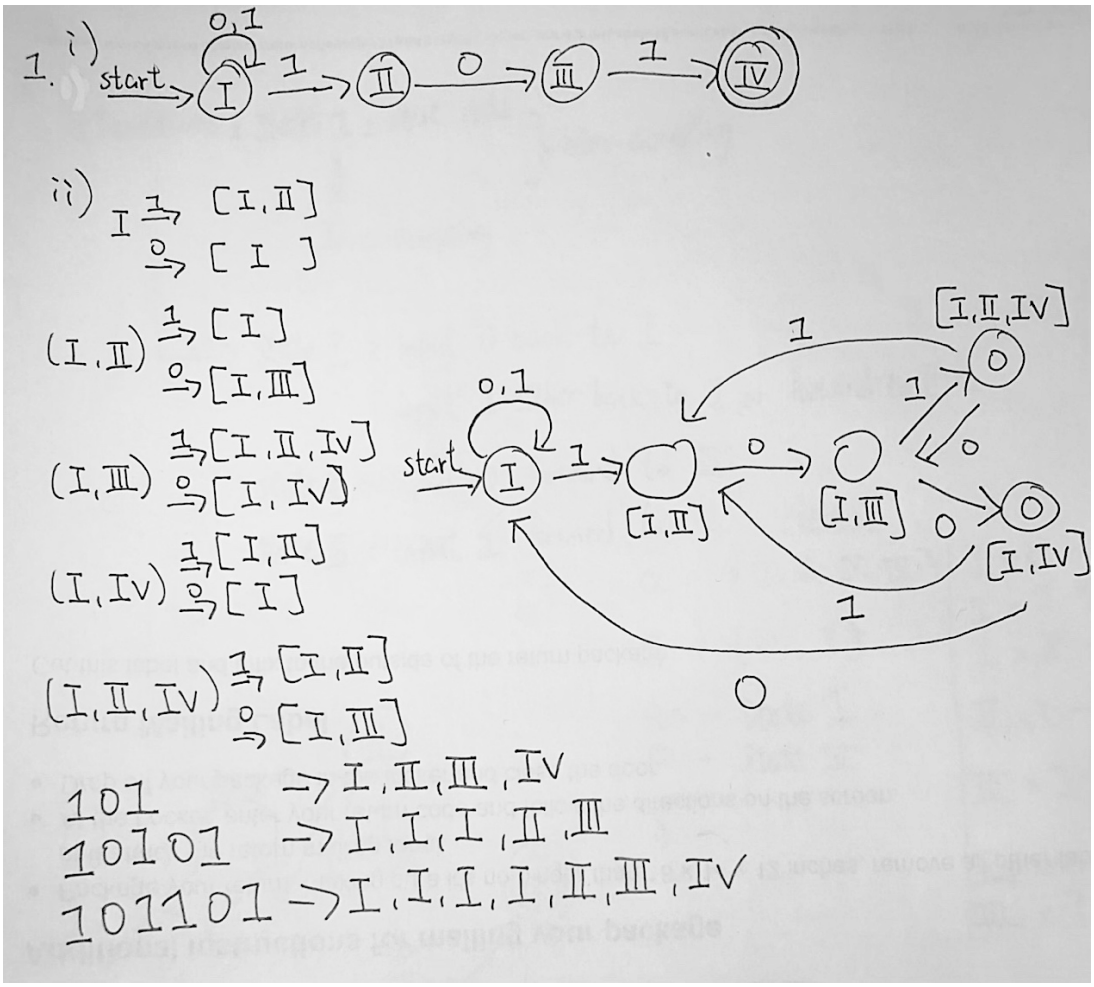
July 09,2020
Group 16

Quiz 1

1.



2.

i. Define a function called “mem” with two arguments, x and L. “x” is a variable, and “L” is a pair/list. The function used conditional expression; it has two conditions with an else. First, if “L” is null, return false. If the first element of the “L” is equal to “x,” return true. Else call the mem function to replace the x within the list/pair apart from the second element of the pair. The target computation is to determine the value of “x” is appear within a list/pair of “L”. It used to list “L” as a data structure.

ii. Define a function named “ins” with two arguments, x and L. x is a variable, and L is a pair/list. The function used if expression to create a new list/pair with cons. It calls the mem function if “mem” returns true, list/pair in mem function, return L. Else, use cons to constructs x and L as a new list/pair. The computation target is to a new pair or list when the list L does not contain x. It used list/pair “L” as a data structure.

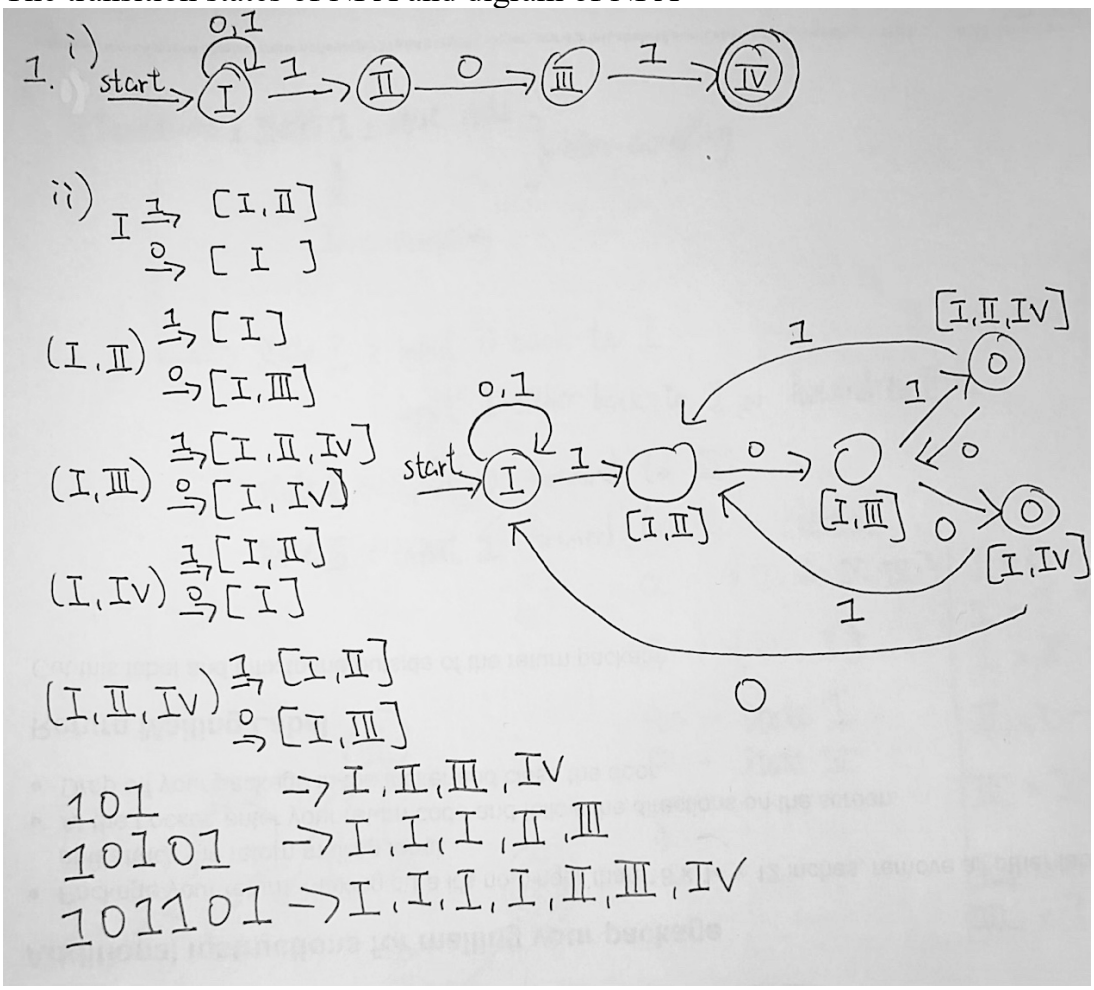
iii. Define a function called “mer” with two arguments, “fst” and “snd”. The function used conditional expression; it has two conditions with an else. First, if fst is null, return snd or snd is null, return fst. Else, the function assigns the first element of fst to x and assign the first element of snd to y. if x is less than y, call the mer function with the second element of fst and snd. Then use cons to constructs a new pair of x and recursively call “mer” function. Else, create a new pair of y and recursively call “mer” function with fst and tje the second element of snd. The target computation is to determine This function used tail-recursive and special form let as static scope.

3. The differences between (i) and (i): (i) uses lists and (ii) uses streams for evaluation. The (ii) require force and delay to process the stream. The similarities where they used different functions but came out similar results.
    i. Define five function: filter, not-diisible-by, sieve, intlist, and primesto.
        - The filter function has two arguments, p and a list/pair L. It has two conditions with an else. If L is null, return L. If the first element of L is same as (cons (car L)), then return (filter p (cdr L)))). Else tail recursion applied to call the fulter function with first argument p and the second argument of the second element of the list L. The data structures are lists and tail recursion used in the call of "mem."
        - The not-divisible-by function has one argument, n. It uses remainder function to determine the remainder dividing the m by n. Check if the remainder is equal zero. If it is zero, return true. Else, return false. Then not function will return opposite value. Use lambda expression to create a new function with argument m and the value from not function.
        - The sieve function has a pair/list L. It used if expression. If L is null, return L. "not-divisible-by" function with argument (car L) is recursive call. Then use filter function to return a list from first argument "not-divisible-by" function and second argument (cdr L) which is second element of L to produce a true value. Call sieve function recursively. Use cons function to constructs a new pair with the first element of L and the sieve function. It used tail recursion.
        - The initlist function has two arguments, m and n. It used if expression. If m is less than n, return empty list. Else, use cons function to construct a new pair with m and the intlist which has (+ 1 m) and n arguments. This function generates a pair/list based to the integer values of m and n.
        - The primesto function has one argument, n. It continuously calls inlist with arguments 2 and n. Then recall sieve with the value from inlist function. It used tail recursion. The target computation is to create integer lists with the inlist function from n to 2.
    ii. Define four functions: filter, sieve, intsfrom, and primes.
        - The filter function has one arguments, p and list L. It used conditional expression. First condition, if L is null, return L. Second condition, if first element of (force L) and (delay (cons (car (force L))) are the same, then return (filte p (cdr (force L))). Else

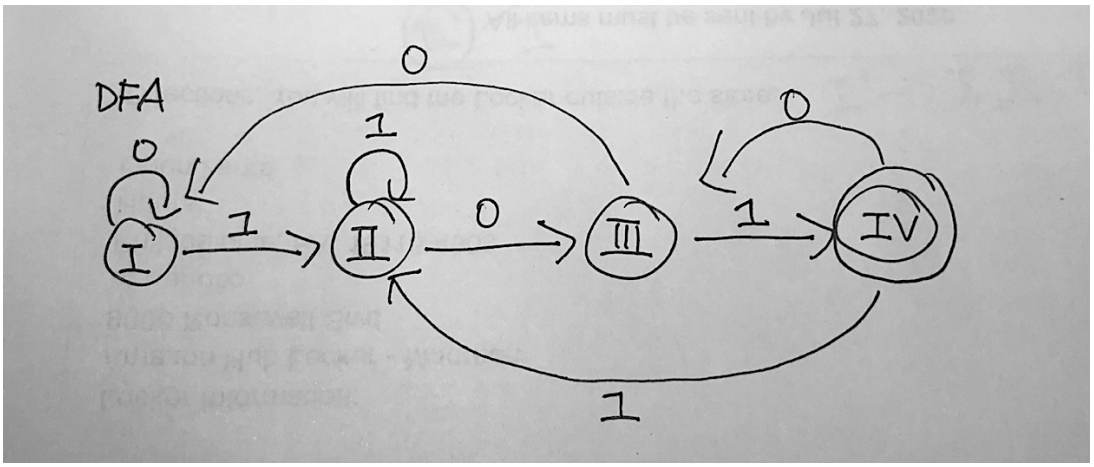
tail recursion is used to call the filter function with p which is same as first argument in p and the (cdr (force L)). The streams use lazy evaluation to return the infinite stream by use force to get the value of L.

- The sieve function has one argument, list L. It has delay function to creates a promise that, when force, evaluates the expression to produce its value. It forces to used con function to constructs a new pair with the first element of (force L) and (sieve (filter (not-divisible-by (car (force L))) (cdr (force L))))). This evaluates to a recursive call of the sieve function with the values of the filter function. After evaluating the not-divisible-by function with the first element of the stream L and the second element or after of the values of the stream L.
- The intsfrom function has one argument, m. It used delay function to evaluates the expression, which is use cons function to construct a new pair with first argument of m and recursive call of intsfrom function with iterating the value if m by 1.
- The primes function has no argument. It calls of intsfrom function with value of 2 as an argument within sieve function. The target computation is to create integer lists with the intsfrom function. The fukter and the not-divisible-by function applied by sieve function in order to return a list that fits within the parameters of the filter.

4. The transition states of NFA and digram of NFA



DFA



DFA for language consisting of all strings over the alphabet ∑ = 0, 1 which end with 101. The proof of Minimum DFA:

Transition Table

	0	1
I	I	II
II	III	II
III	I	IV
IV	III	II

Minimizing the DFA:
0 equivalence: {*I, II, III*}, {*IV*}
1 equivalence: {*I, II*}, {*III*}, {*IV*}
2 equivalence: {*I*}, {*II*}, {*III*}, {*IV*}

Conclusion:

The proves that no states are equivalent to each other. Therefore, this is why the DFA for the language have a minimum of four states.