Course: System Analysis | **Mid-Term Exam (1) Solution Manual**
Date: 24 / 11 / 2019 | **Time: 1.30 H**

Question (1): **(10 marks):**

1.a.

$$\{x \in \text{Integers} \mid x / 4 \in \text{Integers}\}$$

1.b.

$$\{x \in \text{Naturals} \setminus \{1\} \mid \forall\, q \in \text{Naturals} \setminus \{1, x\},\ x / q \notin \text{Naturals}\}$$

2.

$$\forall\, x \in [\text{Reals} \longrightarrow \text{Reals}] \text{ and } \forall\, n \in \text{Naturals}_0$$

$$H(x)(n) = |x(n)|$$

Question (2):

1.

States = {a, b, c}

Inputs = {0, 1}

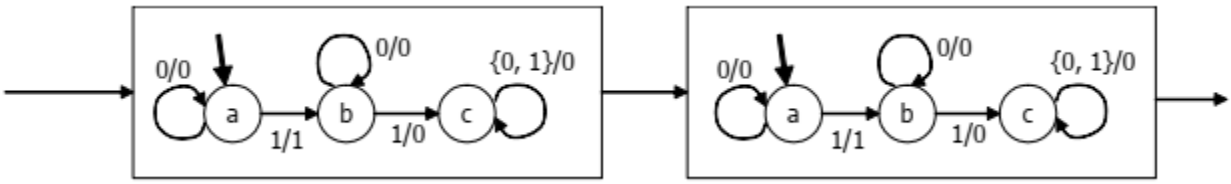
Outputs = {0, 1}

initialState = a

	(s(n+1), y(n))= update(s(n), x(n))	
Current State s(n)	Input x(n) = 0	Input x(n) = 1
a	(a, 0)	(b, 1)
b	(b, 0)	(c, 0)
c	(c, 0)	(c, 0)

2. $y = 0^{k}\ 1\ 0^{m+n-1}$

Question (3): **(10 marks).**



The machine starts out in (a,a).
It stays there until an input of 1 is received.
Then the machine goes to (b,b).
It stays there until another input of 1 is received.
Then the machine goes to (c, b).
It then stays there forever.
So the only reachable states are {(a, a), (b, b), (c, b)}.

Hence, the unreachable states are:

{(a,b), (a, c), (b, a), (b, c), (c, a), (c, c)}