Quiz-3

1.

A) $\delta(q_0, 10)$ = Undefined

since, M has only 0, 1 in it's alphabet & 10 is not part of it.

B) $\hat{\delta}(q_1, 101)$

We know that,

$$\hat{\delta}(q, w) = \begin{cases} q & \text{if } w = \epsilon \\ \delta(\hat{\delta}(q, u), a) & \text{if } w = ua \end{cases}$$

so, $\hat{\delta}(q_1, 101) = \hat{\delta}(\hat{\delta}(q_1, 10), 1)$

$= \delta(\hat{\delta}(\hat{\delta}(q_1, 1), 0), 1)$

$= \delta(\delta(\delta(\hat{\delta}(q_1, \epsilon), 1), 0), 1)$

$= \delta(\delta(\delta(q_1, 1), 0), 1)$

$= \delta(\delta(q_2, 0), 1)$

$= \delta(q_3, 1)$

$= q_3$

$\therefore \hat{\delta}(q_1, 101) = q_3$

C) The language of M, $L(M) = \{01\}$

2.

A) $\hat{\delta}(q, \epsilon) = q$

B) $\hat{\delta}(q, ax) = \hat{\delta}(\delta(q, a), x)$

Proof:

We know that,

$$\hat{\delta}(q, uv) = \hat{\delta}(\hat{\delta}(q, u), v)$$

Let $u = a$

$$\hat{\delta}(q, av) = \hat{\delta}(\hat{\delta}(q, a), v)$$

we know that,

$$\hat{\delta}(q, a) = \delta(\hat{\delta}(q, \epsilon), a)$$

$$= \delta(q, a)$$

so, $\hat{\delta}(q, av) = \hat{\delta}(\delta(q, a), v)$