```
0001101   0001101   0001101
   8         8         1
0000101   0000101   0000001
   1         2         3
0000001   0000001   0000010
   4         5         5
0000011   0000011   0000011
   6         6         6
0000011   0000011   0000011
   7         9         9
```

iii) a) $f(2) = 1$ (finishing in state 9)
$f(4) = 2$ (finishing in state 9)
$f(5) = 2$ (finishing in state 10)
$f(6) = 3$ (finishing in state 9)
$f(9) = 4$ (finishing in state 10)

b) In general (like a fool I worked out $f(5)$, $f(6)$ and $f(9)$, to be sure) good.

$$f(n) = \begin{cases} \frac{n}{2} & \text{if } n \text{ is even, finishing in state 9} \\ \frac{n-1}{2} & \text{if } n \text{ is odd, finishing in state 10.} \end{cases}$$

Starting in state 1, the machine erases two 1s between states 1 and 3 (unless $n=1$, in which case it erases a 1 in state 1 and moves through state 2 to state 10, then stops), then moves to the right most end of the block of 1s, and one space more, in state 4. On moving to state 5 it moves right one more space. If there is a one there (the machine is designed to store ½ the no of ones it has subtracted from