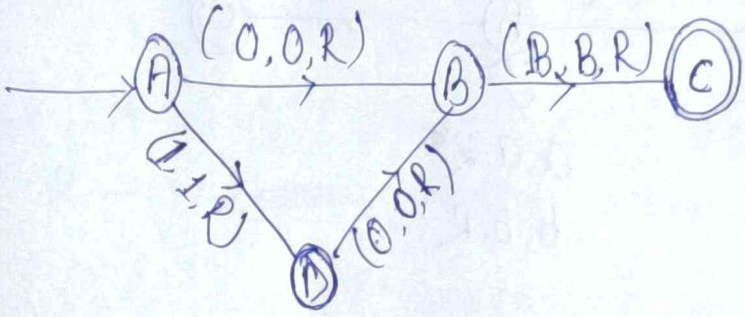
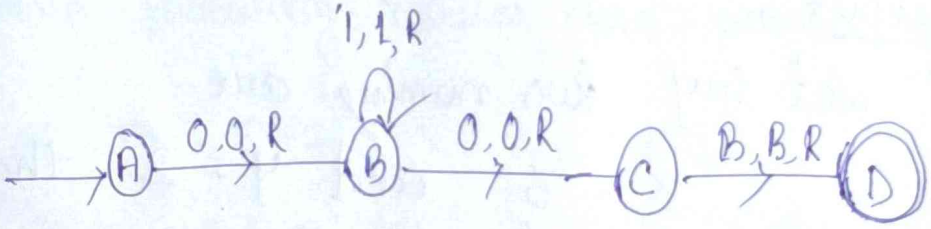
Solution_TM_Tutorial

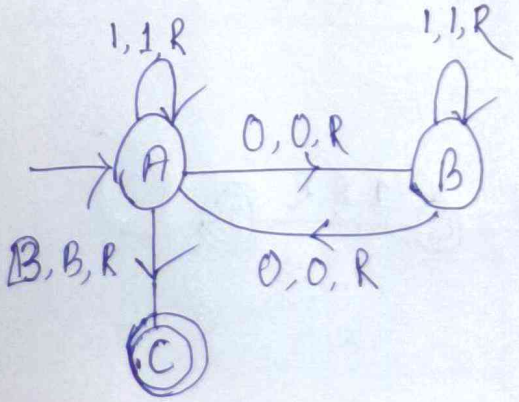
Q1 Construct a Turing machine that accepts the Regular Language $L = \{0, 10\}$ over $\Sigma = \{0, 1\}$



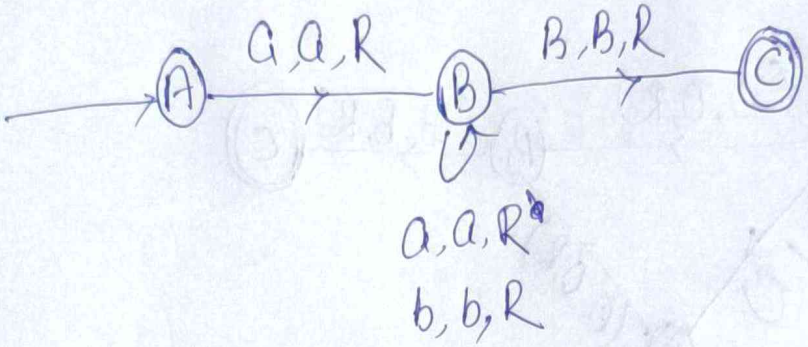
Q2 Construct TM for $L = \{0\,1^*0\}$



Q3 $L = \{w \in (0+1)^* \mid n_0(w) = \text{Even}\}$



Q4 $L = \{w = a(a+b)^*\}$



Q5 Construct a TM that takes 2 non-negative integers as input and produces their sum as output.

Sol^n Let say two numbers are

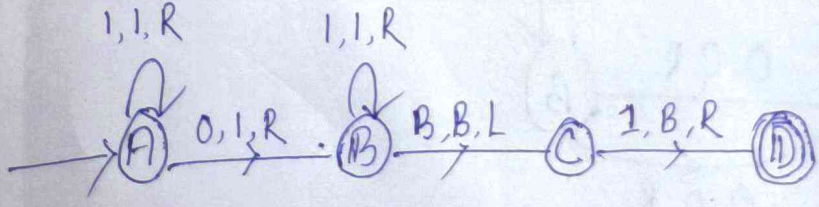
$x = 3$ and $y = 2$ then

We can represent both using unary number {1}.

then

$x + y$ = BB111011BB ← Given

BB11111BB = 5 ← Any



Q6 construct a TM which computes the addition of two positive integers (m+n), where :- the input string is $\#0^m10^n\#$ - format.

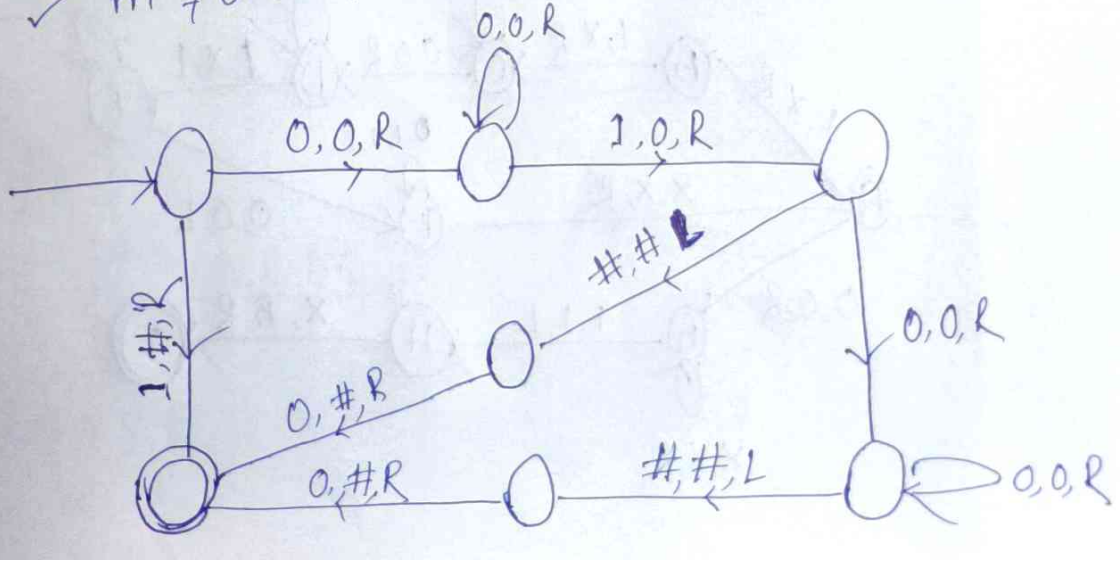
Sol^n

Let TM = $(Q, \{0,1,\#\}, \delta, s, h)$ computes the addition of 2 - integers m & n. then.

$$f(m,n) = \begin{cases} m+n, & \text{if } m,n \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

→ Here '1' on the tape seperates both m & n. Hence following values are possible for m & n.

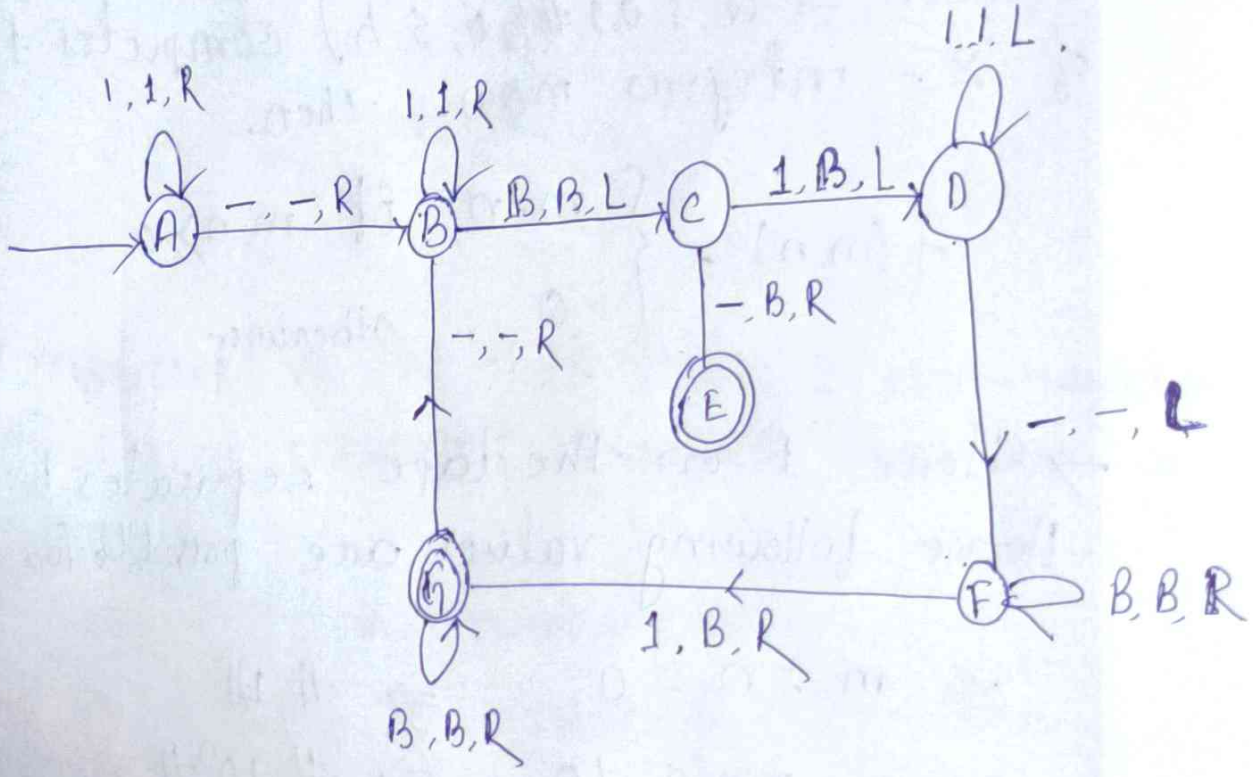
- ✓ $m = n = 0 \Rightarrow \#1\#$
- ✓ $m = 0$ & $n \neq 0 \Rightarrow \#10^n\#$
- ✓ $m \neq 0$ & $n = 0 \Rightarrow \#0^m1\#$
- ✓ $m \neq 0$ & $n \neq 0 \Rightarrow \#0^m10^n\#$ then.



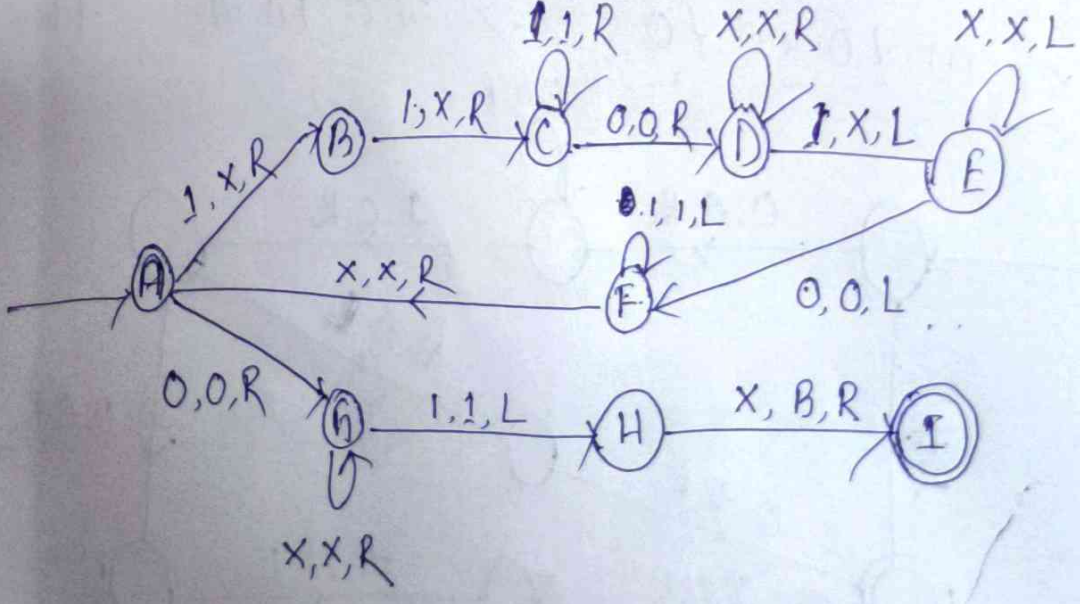
Q7. Construct a TM for

$f(x,y) = x - y, \quad x > y$

Soln $6 - 4 = 2 \Rightarrow 111111 - 1111 = 11$



OR (if 11110111)



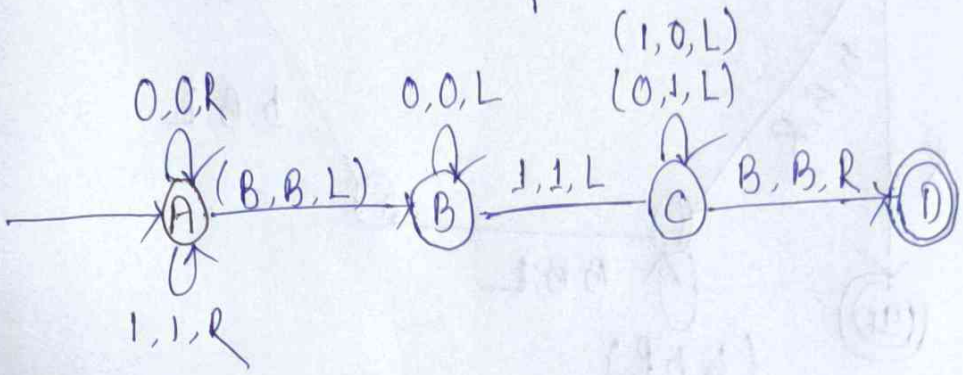
Q8 Construct a TM for finding the 2's complement of a given binary number.

Sol^n

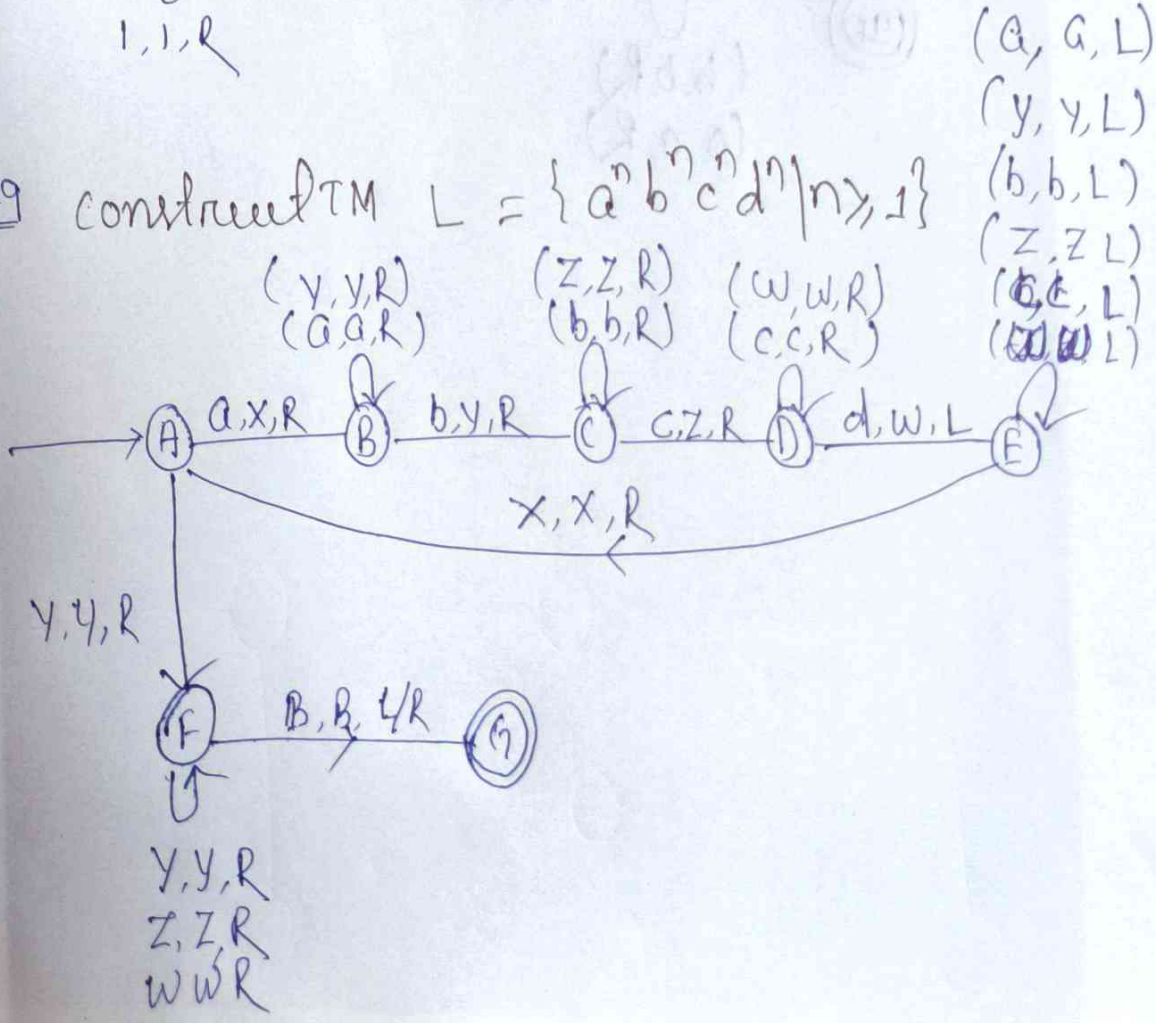
Analysis — 0111000 → 1001000

(complement) same

→ Input : BB 0111000 BB



Q9 Construct TM $L = \{a^n b^n c^n d^n \mid n \geq 1\}$



Q10 construct a TM for

$L = \{ w w^R \mid w \in (a+b)^* \}$