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HOMEWORK - 2

1 CONCEPT CHECK.

1. (a) $P(\neg \text{lack})$

$= 0.19 + 0.13 + 0.02 + 0.09$

$= 0.43$

(b) $P(\text{rusty})$

$= 0.1 + 0.3 + 0.19 + 0.13$

$= 0.72$

(c) $P(\text{lack} \mid \text{clean} \wedge \neg \text{rusty})$

$= \dfrac{0.13}{0.13 + 0.02} = 0.867$

(d) $P(\text{clean} \mid \text{rusty} \vee \text{lack})$

$= \dfrac{0.1}{0.1 + 0.3} = 0.25$

2. $P(s) = 0.01$

$P(m) = 1/50{,}000$

$P(s|m) = 0.7$

$P(m|s) = (P(s|m)\ P(m)) / P(s)$

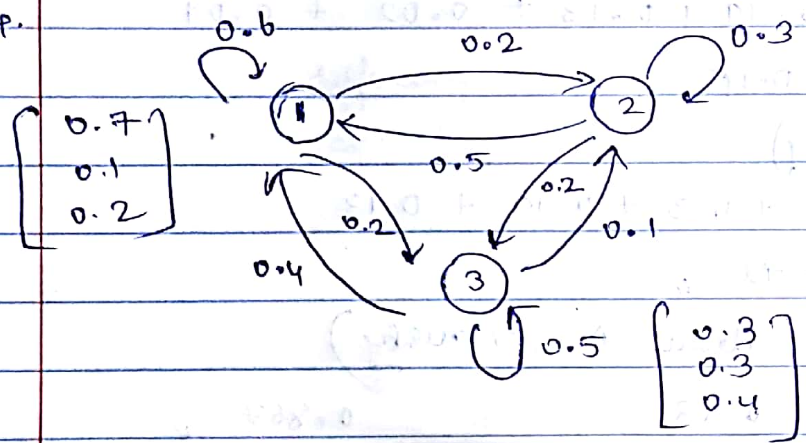
$= \dfrac{0.7 \times 1}{50{,}000 \times 0.01} = 1.4 \times 10^{-5}$

3. UP, UP, DOWN, UP.

$0.5 \times 0.6 \times 0.2 \times 0.5$

$= 0.03.$

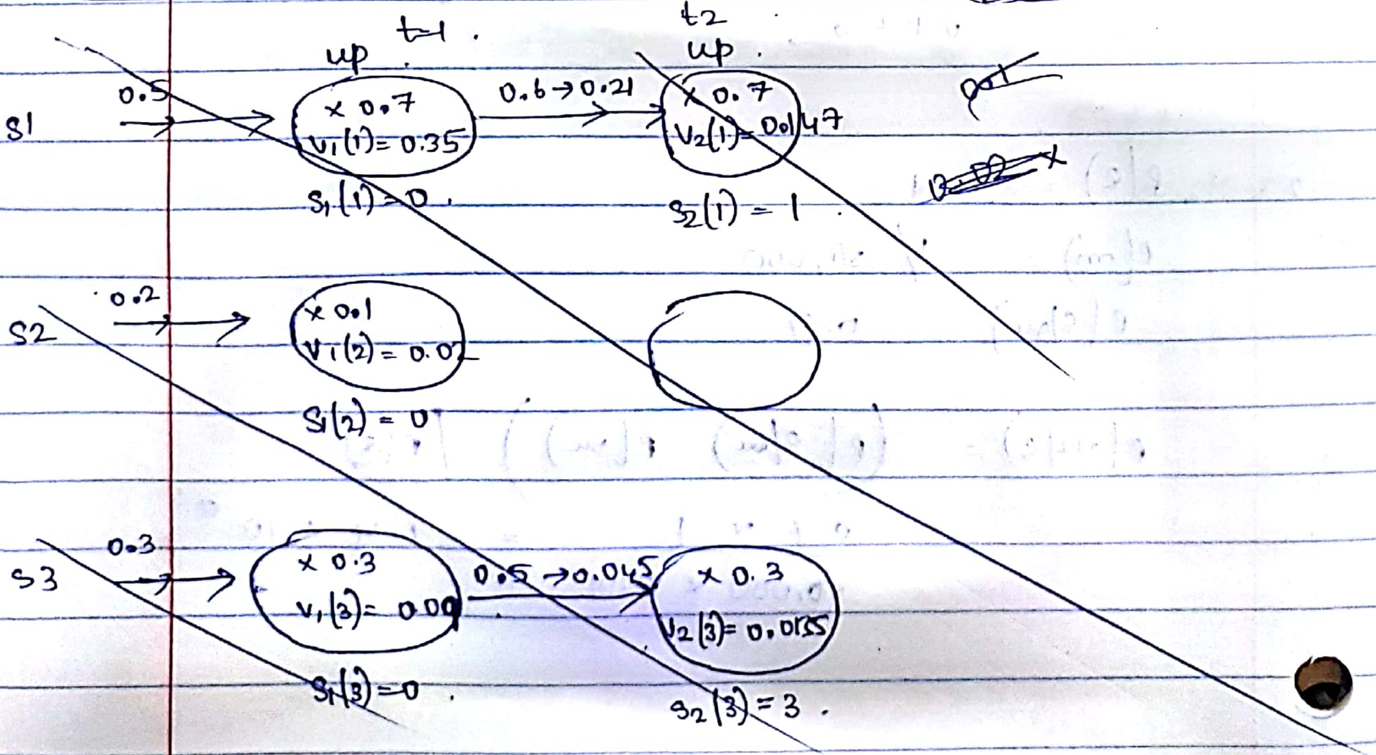
4.



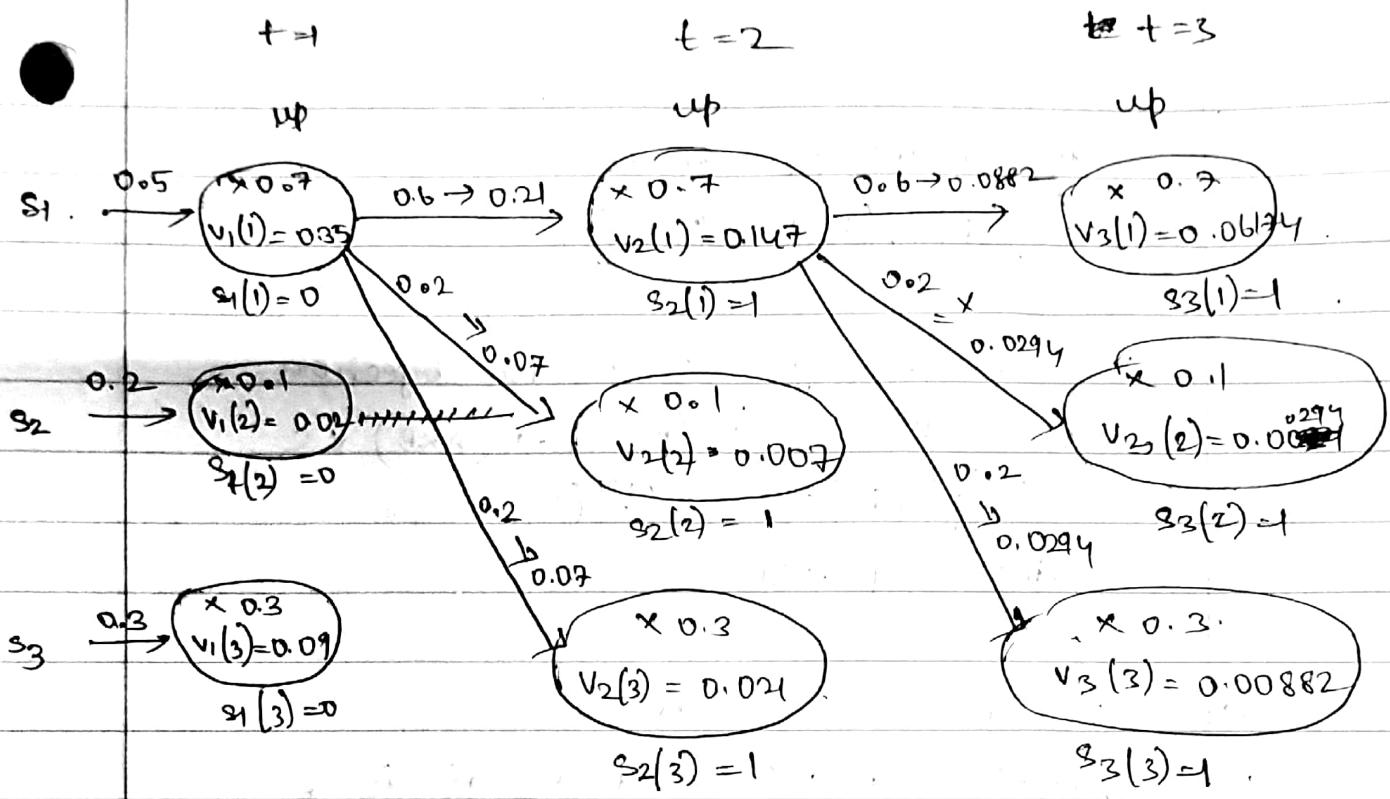
up 0.5

down 0.2

unchanged 0.3



max = 1



max ⇒ 1 max = 1 max = 1

Therefore for UP UP UP →
states might be 1, 1, 1.

FUN WITH PROOFS.

1. To prove that $(A \times B) \times C \cong A \times (B \times C)$

$f: C \to A \times B$

$f(c): B \to A$

$g: B \times C \to A$

$g(b, c) \in A$.

a new function

$p: (A \times B) \times C \to A \times (B \times C)$.

by using the condition

$$P(f)(b,c) = f(b)(c)$$

this eventually results in bijection

$$Q = P^{-1} = A \times (B \times C) \to (A \times B) \times C$$

$$Q(g)(b)(c) = g(b)(c)$$

hence proved

21. $A \times B \approx B \times A$

Suppose A is not equal to B

case 1 :

$A \not\subset B$

$x \in A$, $x \notin B$

$y \in B$ $\therefore (x,y) \in A \times B$

but $(x,y) \notin B \times A$. $[\because x \notin B]$

$A \times B \neq B \times A$.

case 2 :

$A \subset B$

$x \in A$, $y \notin A$, $y \in B$

$(x,y) \in A \times B$

$(x,y) \notin B \times A$. $[\because y \notin A]$.

Therefore $A \times B \neq B \times A$.

Only it is equal if $A = B$.

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3. $P(A \cap B/C) = P(A/C)\, P(B/C)$

P.T.

$P(A \cap B/C) = P(A/C) \cdot P(B/C)$ if and only if

$$P(A/B \cap C) = P(A/C)$$

$$P(A \cap B/C) = P_C(A \cap B)$$
$$= P_C(A/B) \cdot P_C(B)$$
$$= P(A/B \cap C)\, P(B/C).$$

if $P(A/B \cap C) = P(A/C)$. then

$$P(A \cap B/C) = P(A/C) \cdot P(B/C).$$

Hence, proved.