Firstly, we need to consider if P(r) holds when r = 0, r = 1 and r = c. Secondly, we need to show P (r) holds when r = r1 + r2, assuming P (r1) and P (r2) both hold(IH). Then, we need to prove P (r) holds when $r = r1 \cdot r2$, assuming P (r1) and P (r2) both hold(IH). Finally, we need to show P(r*) holds, assuming P(r) holds(IH).

$P(r,+r_{2})$ $\text{nullable } (r_{1}+r_{2}) \text{ iff } \exists \in \exists (r_{1}+r_{2})$ $P(r_{1}) : \text{nullable } (r_{1}) \text{ iff } \exists \exists \in \exists (r_{1})$ $P(r_{1}) : \text{nullable } (r_{1}) \text{ iff } \exists \exists \in \exists (r_{2})$ $P(r_{1}+r_{2}) : \text{nullable } (r_{1}) \text{ iff } \exists \exists \in \exists (r_{2})$ $\text{nullable } (r_{1}) \vee \text{nullable } (r_{2}) \longrightarrow \exists \in \exists (r_{1}) \cup \exists (r_{2})$ $\text{nullable } (r_{1}) \vee \text{nullable } (r_{2}) \qquad \exists \exists \in \exists (r_{1}) \cup \exists (r_{2})$ $\text{from } (r_{2})$ $\exists \in \exists (r_{1}) \vee \exists \in \exists (r_{2})$
$\begin{array}{lll} \cdot P(r_1 \cdot r_2) & \text{nothable } (r_1 \cdot r_2) & \text{iff } \left[\exists \in L(r_1 \cdot r_2) \right] \\ P(r_1) & \text{nothable } (r_1) \rightarrow \exists \exists \in L(r_1) \right] & \text{I} \\ P(r_2) & \text{nothable } (r_2) \rightarrow \exists \exists \in L(r_2) \end{array}$ $\begin{array}{ll} P(r_1, r_2) & \text{nothable } (r_1 \cdot r_2) \rightarrow \exists \exists \in L(r_1, r_2) \\ & \text{nothable } (r_2) \land \text{nothable } (r_3) & \text{nothable } (r_4) \end{array}$ $\begin{array}{ll} \left[\exists \in L(r_1) \land \exists \in L(r_2) \rightarrow \exists \in L(r_1) \land \exists \in L(r_2) \right] \end{array}$
even used here.

```
Q2
~0
Q3
r^+ = r \cdot r^*
r^? = 1+r^n = r^n
ifn=0, r{0}=1 ifn=1, r{1}=r
if n = n+1, r\{n+1\} = r \cdot r^n
r\{m,n\}=
```

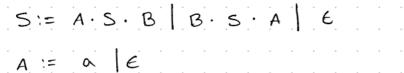
for m = 0, n = 0, $r\{0,0\} = 1$

for $m = n, r\{m,n\} = r\{n\}$ for m < n, $r\{m\}+r\{m+1\}.....+r\{n\}$

Q4

Yes, yes, no

Q5



B :=



Q6 All even-length palindromes over the alphabet {a,b}