Programming Language Compilation

Carefully describe how to construct the precedence matrix for a given grammar, illustrating your answer by investigating whether the following is a precedence grammar.

\[
\begin{align*}
S & \rightarrow a \ P \ Q \ b \ | \ c \ Q \ P \ d \\
P & \rightarrow X \\
Q & \rightarrow Y \\
X & \rightarrow p \ | \ X \ x \ Y \\
Y & \rightarrow q \ | \ y \ Y \ z
\end{align*}
\]

[10 marks]

Explain why replacing the productions

\[
\begin{align*}
S & \rightarrow a \ P \ Q \ b \ | \ c \ Q \ P \ d
\end{align*}
\]

by

\[
\begin{align*}
S & \rightarrow a \ X \ Y \ b \ | \ c \ Y \ X \ d
\end{align*}
\]

would introduce conflicts in the precedence matrix. [2 marks]

Give a detailed description of a parsing algorithm that uses a precedence matrix. [8 marks]