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.

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

[10 marks]

Explain why replacing the productions

\[
S \rightarrow a\ P\ Q\ b \mid c\ Q\ P\ d
\]

by

\[
S \rightarrow a\ X\ Y\ b \mid c\ Y\ X\ d
\]

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

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