Comparative Programming Languages

Consider the Prolog procedures named \(s\) and \(p\) defined as follows:

\[
\begin{align*}
\text{s}(H, [H|T], T). \\
\text{s}(H, [N|T], [N|L]) & : - \text{s}(H, T, L). \\
p(X, [H|T]) & : - \text{s}(H, X, Z), p(Z, T). \\
p([], []). 
\end{align*}
\]

(a) Show how Prolog would evaluate the goal \(s(H, [a,b,c], T)\) giving all the successive instantiations of \(H\) and \(T\) that cause the goal to be satisfied, and hence describe in words what \(s\) does. [6 marks]

(b) What value of \(Q\) causes the goal \(p([a], Q)\) to be satisfied? [3 marks]

(c) What values of \(Q\) cause the goal \(p([a,b], Q)\) to be satisfied? [4 marks]

(d) What values of \(Q\) cause the goal \(p([a,b,c], Q)\) to be satisfied? [5 marks]

(e) Describe in words what \(p\) does. [2 marks]