Specification and Verification I

(a) Explain the difference between the soundness and completeness of a deductive system. [4 marks]

(b) Why is soundness generally thought of as more important than completeness? [4 marks]

(c) Give an example of a true partial correctness specification that cannot be proved in the version of Hoare logic presented in the lectures. Explain why your example cannot be proved. [4 marks]

(d) Devise an instance of the following rule to show that it is not sound.

\[
\begin{array}{c}
\{P\} \ C \ \{Q\} \\
\{P \land R\} \ C \ \{Q \land R\}
\end{array}
\]

[4 marks]

(e) Devise sufficient conditions on \(C\) and \(R\) that make the rule above sound. Briefly explain why your conditions ensure soundness. [4 marks]