Specification and Verification I

(a) Define the specification \([P, Q]\) as used in program refinement. [2 marks]

(b) Devise refinement rules for FOR-commands. [8 marks]

(c) Show how your rule can be justified using Floyd–Hoare logic. [4 marks]

(d) Use your rule to show that

\[
[SUM=0 \land 1 \leq M, \ SUM = M \times N] \supseteq \text{FOR } I := 1 \text{ UNTIL } M \text{ DO } SUM := SUM + N
\]

[6 marks]