

7 Hoare Logic (MJCG)

- (a) Explain informally the difference between Gödel’s completeness theorem and his first incompleteness theorem. [8 marks]
- (b) State the meaning of Hoare triples $\{P\} C \{Q\}$ in separation logic. [3 marks]
- (c) For each Hoare triple (i), (ii) and (iii) below state whether the triple is true. Explain your answer and if the triple is true give a proof using separation logic. You may assume $\vdash P$ if P is a true separation statement (e.g. $\vdash X \mapsto 0 \Rightarrow X \mapsto _$). Such assumed statements should be stated explicitly and informally justified.
- (i) $\{X = 0\} [X] :=1 \{0 \mapsto 1\}$
- (ii) $\{X \doteq 0\} [X] :=1 \{0 \mapsto 1\}$
- (iii) $\{X \doteq 0 \wedge X \mapsto 0\} [X] :=1 \{0 \mapsto 1\}$

[9 marks]