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. $\vdash \mathtt{X} \mapsto 0 \ \Rightarrow\ \mathtt{X} \mapsto \_$). Such assumed statements should be stated explicitly and informally justified.

(*i*) $\{\mathtt{X} = 0\}\ [\mathtt{X}] := 1\ \{0 \mapsto 1\}$

(*ii*) $\{\mathtt{X} \doteq 0\}\ [\mathtt{X}] := 1\ \{0 \mapsto 1\}$

(*iii*) $\{\mathtt{X} \doteq 0\ \wedge\ \mathtt{X} \mapsto 0\}\ [\mathtt{X}] := 1\ \{0 \mapsto 1\}$

[9 marks]

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