

COMPUTER SCIENCE TRIPOS Part IB – 2015 – Paper 6

5 Logic and Proof (LCP)

- (a) Give and explain the inference rules of resolution and factoring, in the context of automated theorem proving. Why is factoring necessary for completeness?

[5 marks]

- (b) For both the following sets of clauses, either exhibit a model or show that none exists. Below, a and b are constants, while w , x , y and z are variables.

(i)

$$\begin{aligned} &\{P, \neg Q(a), \neg Q(b), R(a)\} \\ &\quad \{\neg P, Q(x), R(b)\} \\ &\quad \quad \{\neg R(b), \neg R(x)\} \end{aligned}$$

[5 marks]

(ii)

$$\begin{aligned} &\{\neg P(x, y), Q(x, y, f(x, y))\} \\ &\quad \{\neg R(y, z), Q(a, y, z)\} \\ &\quad \quad \{R(y, z), \neg Q(a, y, z)\} \\ &\quad \{P(x, g(x)), Q(x, g(x), z)\} \\ &\quad \quad \{\neg R(x, y), \neg Q(x, w, z)\} \end{aligned}$$

[10 marks]