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)

$$\{ P, \neg Q(a), \neg Q(b), R(a) \} \\ \{ \neg P, Q(x), R(b) \} \\ \{ \neg R(b), \neg R(x) \}$$

[5 marks]

(ii)

$$\{ \neg P(x, y), Q(x, y, f(x, y)) \}$$

$$\{ \neg R(y, z), Q(a, y, z) \}$$

$$\{ R(y, z), \neg Q(a, y, z) \}$$

$$\{ P(x, g(x)), Q(x, g(x), z) \}$$

$$\{ \neg R(x, y), \neg Q(x, w, z) \}$$

[10 marks]