

15 Types (AMP)

- (a) In Mini-ML, define the relation of *specialisation* between
- (i) type schemes and types, $\forall A (\tau) \succ \tau'$ [1 mark]
 - (ii) type schemes and type schemes, $\forall A (\tau) \succ \forall A' (\tau')$ [2 marks]
- (b) What is meant by the *principal* type scheme of a closed expression in Mini-ML? [2 marks]
- (c) State the *Hindley-Damas-Milner Theorem* for the Mini-ML typeability problem. [2 marks]
- (d) Define what is meant by a Mini-ML *typing problem*. Outline a type inference algorithm for Mini-ML that operates on typing problems. You should explain what is a *solution* and a *principal solution* for a typing problem, state the properties of the output of the algorithm and explain its overall structure. How does the algorithm make use of fresh type variables and of unification? Illustrate your answer by describing how the algorithm operates on function application expressions. [13 marks]