## COMPUTER SCIENCE TRIPOS Part IB – 2024 – Paper 6

## **3** Computation Theory (ad260)

- (a) Define the collection of *primitive recursive functions*. [2 marks]
- (b) What does it mean to say that a function  $f : \mathbb{N} \to \mathbb{N}$  is  $\lambda$ -definable. [2 marks]
- (c) For each of these functions, show that it is primitive recursive and explain why it is  $\lambda$ -definable.
  - (i)  $fact(x) \triangleq x!;$  [7 marks]
  - (*ii*)  $\operatorname{cond}(x, y, z) \triangleq \begin{cases} y & \text{if } x = 0 \\ z & \text{otherwise} \end{cases}$  [7 marks]
- (d) Give an example of a function that is  $\lambda$ -definable but not primitive recursive. You do not need to give a proof of the fact. [2 marks]