

### 1994 Paper 2 Question 3

State carefully the conditions for a relation  $R$  on a set  $S$  to be:

(a) a partial order;

(b) a total order;

(c) a well-order, as applied to both (a) and (b). [6 marks]

Let  $S$  consist of ordered pairs of positive integers  $(i, j)$  such that  $j > i$ . Define relations on  $S$  that are

(a) totally and well-ordered;

(b) partially (not totally) and well-ordered;

(c) totally but not well-ordered. [14 marks]

In each case, explain why.