Semantics of Programming Languages

What does it mean to say that two configurations of a labelled transition system are bisimilar? [3 marks]

Describe a labelled transition system for a language of communicating processes with input prefixing \( (c(x) \cdot P) \), output prefixing \( (\bar{c}(E) \cdot P) \), an inactive process \( (0) \), choice \( (P + P') \), parallel composition \( (P|P') \) and channel restriction \( (\nu c \cdot P) \). You may assume there is a relation \( E \downarrow n \) which defines when an integer expression \( E \) evaluates to an integer \( n \). [7 marks]

For each of the following pairs of processes, say whether or not they are bisimilar. Justify your answer in each case.

(a) \( \bar{c}(1) \cdot ((\bar{c}(2) \cdot 0) + (\bar{c}(3) \cdot 0)) \) and \( (\bar{c}(1) \cdot \bar{c}(2) \cdot 0) + (\bar{c}(1) \cdot \bar{c}(3) \cdot 0) \) [4 marks]

(b) \( P \) and \( \nu c \cdot ((c(x) \cdot 0)|(\bar{c}(1) \cdot P)) \), where \( c \) does not occur in \( P \) [6 marks]