2001 Paper 6 Question 9

Semantics of Programming Languages

Write short notes on *four* of the following five topics.

(a) The relationship between three forms of operational semantics of the Language of Commands (LC) given by

- an evaluation relation $\langle P, s\rangle \Downarrow \langle V, s'\rangle$
- a transition relation $\langle P, s\rangle \rightarrow \langle P', s'\rangle$
- a transition relation between the configurations $\langle c, r, s\rangle$ of the SMC-machine

(b) The notion of *semantic equivalence* of LC phrases and its congruence property.

(c) *Call-by-name* and *call-by-value* rules for evaluating function applications in the Language of Functions and Procedures (LFP) and the relationship between the evaluation relations for LFP based upon each of them.

(d) The notion of *bisimilarity* of two configurations in a labelled transition system.

(e) The rules defining the possible labelled transitions of parallel composition ($P_1|P_2$) and restriction ($\nu\, c\,.\, P$) in the Language of Communicating Processes (LCP).

[5 marks each]