1998 Paper 4 Question 2

Concurrent Systems

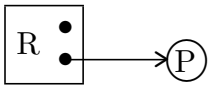
In a system which allocates resources dynamically

(*a*) What are the resource allocation policies that make it necessary to consider the possibility of deadlock? [3 marks]

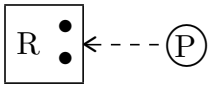
(*b*) If there is one instance of each resource type what is the necessary and sufficient condition for deadlock to exist? [2 marks]

Using the notation

- for an instance of a resource



process P has an instance of resource R



process P is requesting an instance of resource R

(*c*) Draw a resource–wait graph for five processes where at least three are deadlocked. [5 marks]

(*d*) Give the allocation and request matrices corresponding to your graph. [5 marks]

(*e*) Illustrate a deadlock detection algorithm using your matrices as an example. [5 marks]