1993 Paper 10 Question 1

Modula-2

Define the terms *opaque type* and *concrete type*.   [5 marks]

The following is a shortened version of one of the definition modules described in the Modula-2 user manual:

```
DEFINITION MODULE Processes;
TYPE
   Semaphore;
Procedure InitSemaphore (VAR a:Semaphore);
Procedure Signal (s:Semaphore);
Procedure Wait (s:Semaphore);
.
.
END Processes.
```

Provide a suitable specification for type `Semaphore` as it might appear in the associated implementation module.   [5 marks]

Write a fragment of Modula-2 code which uses a variable of type `Semaphore` and exploits the three procedures given above. Explain what the code does when each of the three procedures is invoked.   [10 marks]