COMPUTER SCIENCE TRIPOS Part II – 2013 – Paper 7

7 Hoare Logic (MOM)

(*a*) Briefly explain the concepts: mechanised program verification and verification conditions (VCs). [4 marks]

(*b*) Consider three consecutive assignments:

$\{ P \}$ `V1 := E1; V2 := E2; V3 := E3` $\{ Q \}$

Write down the VCs that are generated for such a program. Give a detailed proof which shows that, if the VCs are true, then the specification above is provable in Hoare Logic. [6 marks]

(*c*) Write down the VCs for the following annotated program. For this part, do *not* attempt to define *Inv*. [4 marks]

$\{ T \}$
`I := 0;`
`X := 0;`
`Y := 1;`
`WHILE (I` $\neq$ `N) DO` $\{ Inv \}$
`  I := I + 1;`
`  X := X + Y;`
`  Y := X + Y`
`OD`
$\{$ `X` $= fib(2 \times$ `N`$) \}$

Here $fib(0) = 0$, $fib(1) = 1$ and $fib(n + 2) = fib(n) + fib(n + 1)$ for $n \in \mathbb{N}$.

(*d*) Provide a definition of *Inv* such that the VCs are provable. Sketch a proof of the VCs. [6 marks]