Homework 6

1. Access-control logic includes formulas of the form

$$P \text{ says } F$$

   where P is a principal and F a formula. Give two inference rules of access-control logic involving *says*.

2. Assume an access control logic with security levels, say top secret (*TS*), secret (*S*) and public (*P*), with

$$slev(P) < slev(S) < slev(TS)$$

   (a) Modify the formula

$$P \text{ controls } Permitted(O, write)$$

   using security levels so that it satisfies the *write rule* from the *Bell-LaPadula* access policy. Do the same again, but satisfy the *write rule* from the *Biba* access policy.

   (b) Modify the formula

$$P \text{ controls } Permitted(O, read)$$

   using security levels so that it satisfies the *read rule* from the *Bell-LaPadula* access policy. Do the same again, but satisfy the *read rule* from the *Biba* access policy.

3. Assume two security levels *S* and *TS*, which are ordered so that $slev(S) < slev(TS)$. Assume further the substitution rules

$$\frac{\Gamma \vdash slev(P) = l_1 \quad \Gamma \vdash slev(Q) = l_2 \quad \Gamma \vdash l_1 < l_2}{\Gamma \vdash slev(P) < slev(Q)}$$

$$\frac{\Gamma \vdash slev(P) = l \quad \Gamma \vdash slev(Q) = l}{\Gamma \vdash slev(P) = slev(Q)}$$

   Let Γ be the set containing the following six formulas

$$slev(S) < slev(TS)$$
$$slev(Agent) = slev(TS)$$
$$slev(File_1) = slev(S)$$
$$slev(File_2) = slev(TS)$$
$$\forall O.\ slev(O) < slev(Agent) \Rightarrow (Agent \text{ controls } Permitted(O, read))$$
$$\forall O.\ slev(O) = slev(Agent) \Rightarrow (Agent \text{ controls } Permitted(O, read))$$

Using the inference rules of access-control logic and the substitution rules shown above, give proofs for the two judgements

$\Gamma \vdash (Agent\ says\ Permitted(File_1, read)) \Rightarrow Permitted(File_1, read)$

$\Gamma \vdash (Agent\ says\ Permitted(File_2, read)) \Rightarrow Permitted(File_2, read)$