Linguagens de Programação
Prof. Bruno Lopes
Lista 3

1. Dois programas PDL são ditos equivalentes se definem na mesma relação binária. Verifique quais dos programas seguintes são equivalentes.

   (a) $\alpha; (\beta; \alpha)^\star$

   (b) $(\alpha; \beta)^\star; \alpha$

   (c)
   ```
   while b do
   begin
     p;
     while c do q
   end
   ```

   (d)
   ```
   if b then
   begin
     p;
     while b or c do
       if c then q else p
   end
   ```

2. Seja o sistema axiomático abaixo para PDL.

   (i) Axiomas da Lógica Clássica Proposicional

   (ii) $[\alpha](\varphi \to \psi) \to ([\alpha]\varphi \to [\alpha]\psi)$

   (iii) $[\alpha](\varphi \wedge \psi) \leftrightarrow ([\alpha]\varphi \wedge [\alpha]\psi)$

   (iv) $[\alpha \cup \beta]\varphi \leftrightarrow ([\alpha]\varphi \wedge [\beta]\varphi)$

   (v) $[\alpha; \beta]\varphi \leftrightarrow [\alpha][\beta]\varphi$

   (vi) $[\psi?]\varphi \leftrightarrow (\psi \to \varphi)$

   (vii) $\varphi \wedge [\alpha][\alpha^\star]\varphi \leftrightarrow [\alpha^\star]\varphi$

   (viii) $\varphi \wedge [\alpha^\star](\varphi \to [\alpha]\varphi) \to [\alpha^\star]\varphi$

   (ix) $\dfrac{\varphi \qquad \varphi \to \psi}{\psi}$

   (x) $\dfrac{\varphi}{[\alpha]\varphi}$

   (xi) $[\alpha]\varphi \leftrightarrow \neg\langle\alpha\rangle\neg\varphi$

   Prove que as fórmulas abaixo são verdadeiras.

   (a) $\langle\alpha^\star\rangle\varphi \leftrightarrow \varphi \vee \langle\alpha^\star\rangle(\neg\varphi \wedge \langle\alpha\rangle\varphi)$

   (b) $\langle\beta; \alpha^\star\rangle\varphi \wedge [\beta^\star; \alpha^\star]\neg\varphi$