thm_2Ebinary__ieee_2Efloat__literal__11 (TM-SzWy2rDH6EF5Aiv5W3xMUmd8QBAozMvi7)

October 26, 2020

Let $c\_2Ebool\_2EARB : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow c\_2Ebool\_2EARB\ A\_27a \in A\_27a \tag{1}$$

Let $ty\_2Ebinary\_\_ieee\_2Efloat : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty\_2Ebinary\_\_ieee\_2Efloat\ A0\ A1) \tag{2}$$

Let $ty\_2Eone\_2Eone : \iota$ be given. Assume the following.

$$nonempty\ ty\_2Eone\_2Eone \tag{3}$$

Let $ty\_2Efcp\_2Ecart : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty\_2Efcp\_2Ecart\ A0\ A1) \tag{4}$$

Let $c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\_\_fupd : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27w.nonempty\ A\_27w \Rightarrow c\_2Ebinary\_\_ieee\_ A\_27t\ A\_27w \in (((ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w)^{(ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w)})^{((ty\_2Efc} \tag{5}$$

Let $c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\_\_fupd : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27u.nonempty\ A\_27u \Rightarrow \forall A\_27 nonempty\ A\_27w \Rightarrow c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\_\_f A\_27t\ A\_27u\ A\_27w \in (((ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27u\ A\_27w)^{(ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w)})^{(\tag{6}$$

Let $c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\_\_fupd : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27w.nonempty\ A\_27w \Rightarrow \forall A\_27x. nonempty\ A\_27x \Rightarrow c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\_\_fupd\ A\_2 A\_27w\ A\_27x \in (((ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27x)^{(ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w)})^{((ty\_2Efc} \tag{7}$$

Let $c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27w.nonempty\ A\_27w \Rightarrow c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27t\ A\_27w \in ((ty\_2Efcp\_2Ecart\ 2\ A\_27t)^{(ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w)}) \tag{8}$$

Let $c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27w.nonempty\ A\_27w \Rightarrow c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27t\ A\_27w \in ((ty\_2Efcp\_2Ecart\ 2\ A\_27w)^{(ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w)}) \tag{9}$$

Let $c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27w.nonempty\ A\_27w \Rightarrow c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27t\ A\_27w \in ((ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone)^{(ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w)}) \tag{10}$$

Definition 1 *We define* c_2Emin_2E_3D_3D_3E *to be* $\lambda P \in 2.\lambda Q \in 2.inj\_\_o\ (p\ P \Rightarrow p\ Q)$ *of type* ι.

Definition 2 *We define* c_2Emin_2E_3D *to be* $\lambda A.\lambda x \in A.\lambda y \in A.inj\_\_o\ (x = y)$ *of type* $\iota \Rightarrow \iota$.

Definition 3 *We define* c_2Ebool_2ET *to be* $(ap\ (ap\ (c\_2Emin\_2E\_3D\ (2^2))\ (\lambda V0x \in 2.V0x))\ (\lambda V1x \in 2.V1$

Definition 4 *We define* c_2Ebool_2E_21 *to be* $\lambda A\_27a : \iota.(\lambda V0P \in (2^{A\_27a}).(ap\ (ap\ (c\_2Emin\_2E\_3D\ (2^{A\_27$

Definition 5 *We define* c_2Ebool_2E_2F_5C *to be* $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap\ (c\_2Ebool\_2E\_21\ 2)\ (\lambda V2t \in 2$

Definition 6 *We define* c_2Ecombin_2EK *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.(\lambda V0x \in A\_27a.(\lambda V1y \in A\_27b.V0x))$

Assume the following.

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27u.nonempty\ A\_27u \Rightarrow \forall A\_27w.\ nonempty\ A\_27w \Rightarrow \forall A\_27x.nonempty\ A\_27x \Rightarrow ((\forall V0f0 \in ((ty\_2Efcp\_2Ecart\ 2\ A\_27x)^{(ty\_2Efcp\_2Ecart\ 2\ A\_27w)}).(\forall V1f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27t\ A\_27x)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\_\_fupd\ A\_27t\ A\_27w\ A\_27x)\ V0f0)\ V1f)) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27t\ A\_27w)\ V1f))))) \wedge ((\forall V2f0 \in ((ty\_2Efcp\_2Ecart\ 2\ A\_27u)^{(ty\_2Efcp\_2Ecart\ 2\ A\_27t)}).(\forall V3f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27u\ A\_27w)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\_\_fu$$

$$A\_27t\ A\_27u\ A\_27w)\ V2f0)\ V3f)) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27t\ A\_27w)\ V3f)))) \wedge ((\forall V4f0 \in ((ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone)^{(ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eo}$$

$$(\forall V5f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27t\ A\_27w)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\_\_fupd$$

$$A\_27t\ A\_27w)\ V4f0)\ V5f)) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27t\ A\_27w)\ V5f)))) \wedge ((\forall V6f0 \in ((ty\_2Efcp\_2Ecart\ 2\ A\_27u)^{(ty\_2Efcp\_2Ecart\ 2\ A\_27t)}).(\forall V7f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27u\ A\_27w)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\_\_$$

$$A\_27t\ A\_27u\ A\_27w)\ V6f0)\ V7f)) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27t\ A\_27w)\ V7f)))) \wedge ((\forall V8f0 \in ((ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone)^{(ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eo}$$

$$(\forall V9f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27t\ A\_27w)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\_\_fupd\ A\_27t\ A\_27w)\ V8f0)\ V9f)) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27t\ A\_27w)\ V9f)))) \wedge ((\forall V10f0 \in ((ty\_2Efcp\_2Ecart\ 2\ A\_27x)^{(ty\_2Efcp\_2Ecart\ 2\ A\_27w)}).(\forall V11f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27t\ A\_27x)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\_\_fupd\ A\_27t\ A\_27w\ A\_27x)\ V10f0)\ V11f)) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27t\ A\_27w)\ V11f)))) \wedge ((\forall V12f0 \in ((ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone)^{(ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone}$$

$$(\forall V13f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27t\ A\_27w)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\_\_fupd\ A\_27t\ A\_27w)\ V12f0)\ V13f)) = (ap\ V12f0\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27t\ A\_27w)\ V13f))))) \wedge ((\forall V14f0 \in ((ty\_2Efcp\_2Ecart\ 2\ A\_27x)^{(ty\_2Efcp\_2Ecart\ 2\ A\_27w)}).(\forall V15f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27t\ A\_27x)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\_\_fupd\ A\_27t\ A\_27w\ A\_27x)\ V14f0)\ V15f)) = (ap\ V14f0\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27t\ A\_27w)\ V15f))))) \wedge (\forall V16f0 \in ((ty\_2Efcp\_2Ecart\ 2\ A\_27u)^{(ty\_2Efcp\_2Ecart\ 2\ A\_27t)}).(\forall V17f \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27u\ A\_27w)\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\_\_fupd\ A\_27t\ A\_27u\ A\_27w)\ V16f0)\ V17f)) = (ap\ V16f0\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27t\ A\_27w)\ V17f)))))))))))) \tag{11}$$

Assume the following.

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27w.nonempty\ A\_27w \Rightarrow (\forall V0f1 \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).(\forall V1f2 \in (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w).((V0f1 = V1f2) \Leftrightarrow (((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27t\ A\_27w)\ V0f1) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\ A\_27t\ A\_27w)\ V1f2)) \wedge (((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27t\ A\_27w)\ V0f1) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\ A\_27t\ A\_27w)\ V1f2)) \wedge ((ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27t\ A\_27w)\ V0f1) = (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\ A\_27t\ A\_27w)\ V1f2)))))))) \tag{12}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow (\forall V0x \in A\_27a.(\forall V1y \in A\_27b.((ap\ (ap\ (\mathsf{c\_2Ecombin\_2EK}\ A\_27a\ A\_27b)\ V0x)\ V1y) = V0x))) \tag{13}$$

Theorem 1

$$\forall A\_27t.nonempty\ A\_27t \Rightarrow \forall A\_27u.nonempty\ A\_27u \Rightarrow \forall A\_27w.\ nonempty\ A\_27w \Rightarrow \forall A\_27x.nonempty\ A\_27x \Rightarrow (\forall V0c11 \in (ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone).(\forall V1c01 \in (ty\_2Efcp\_2Ecart\ 2\ A\_27x).(\forall V2c1 \in (ty\_2Efcp\_2Ecart\ 2\ A\_27u).(\forall V3c12 \in (ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone).(\forall V4c02 \in (ty\_2Efcp\_2Ecart\ 2\ A\_27x).(\forall V5c2 \in (ty\_2Efcp\_2Ecart\ 2\ A\_27u).(((ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\_\_fupd\ A\_27u\ A\_27x)\ (ap\ (\mathsf{c\_2Ecombin\_2EK}\ (ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone)\ (ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone))\ V0c11))\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\_\_fupd\ A\_27u\ A\_27w\ A\_27x)\ (ap\ (\mathsf{c\_2Ecombin\_2EK}\ (ty\_2Efcp\_2Ecart\ 2\ A\_27x)\ (ty\_2Efcp\_2Ecart\ 2\ A\_27w))\ V1c01))\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\_\_fupd\ A\_27t\ A\_27u\ A\_27w)\ (ap\ (\mathsf{c\_2Ecombin\_2EK}\ (ty\_2Efcp\_2Ecart\ 2\ A\_27u)\ (ty\_2Efcp\_2Ecart\ 2\ A\_27t))\ V2c1))\ (c\_2Ebool\_2EARB\ (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w))))) = (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Sign\_\_fupd\ A\_27u\ A\_27x)\ (ap\ (\mathsf{c\_2Ecombin\_2EK}\ (ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone)\ (ty\_2Efcp\_2Ecart\ 2\ ty\_2Eone\_2Eone))\ V3c12))\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Exponent\_\_fupd\ A\_27u\ A\_27w\ A\_27x)\ (ap\ (\mathsf{c\_2Ecombin\_2EK}\ (ty\_2Efcp\_2Ecart\ 2\ A\_27x)\ (ty\_2Efcp\_2Ecart\ 2\ A\_27w))\ V4c02))\ (ap\ (ap\ (c\_2Ebinary\_\_ieee\_2Efloat\_\_Significand\_\_fupd\ A\_27t\ A\_27u\ A\_27w)\ (ap\ (\mathsf{c\_2Ecombin\_2EK}\ (ty\_2Efcp\_2Ecart\ 2\ A\_27u)\ (ty\_2Efcp\_2Ecart\ 2\ A\_27t))\ V5c2))\ (c\_2Ebool\_2EARB\ (ty\_2Ebinary\_\_ieee\_2Efloat\ A\_27t\ A\_27w)))))) \Leftrightarrow ((V0c11 = V3c12) \wedge ((V1c01 = V4c02) \wedge (V2c1 = V5c2))))))))))$$