thm_2EdefCNF_2EOK__ind (TMQnJESZV6boH8z98b4jQshUq8A37Dwrwxr)

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Let $ty\_2Enum\_2Enum : \iota$ be given. Assume the following.

$$nonempty\ ty\_2Enum\_2Enum \quad (1)$$

Definition 1 *We define* $\mathsf{c\_2Emin\_2E\_3D}$ *to be* $\lambda A.\lambda x \in A.\lambda y \in A.inj\_\_o\ (x = y)$ *of type* $\iota{\Rightarrow}\iota$.

Definition 2 *We define* $\mathsf{c\_2Ebool\_2ET}$ *to be* $(ap\ (ap\ (\mathsf{c\_2Emin\_2E\_3D}\ (2^2))\ (\lambda V0x \in 2.V0x))\ (\lambda V1x \in 2.V1$

Let $ty\_2Epair\_2Eprod : \iota{\Rightarrow}\iota{\Rightarrow}\iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0{\Rightarrow}\forall A1.nonempty\ A1{\Rightarrow}nonempty\ (ty\_2Epair\_2Eprod\ A0\ A1) \quad (2)$$

Definition 3 *We define* $\mathsf{c\_2Emin\_2E\_3D\_3D\_3E}$ *to be* $\lambda P \in 2.\lambda Q \in 2.inj\_\_o\ (p\ P{\Rightarrow}p\ Q)$ *of type* ι.

Definition 4 *We define* $\mathsf{c\_2Ebool\_2E\_21}$ *to be* $\lambda A\_27a : \iota.(\lambda V0P \in (2^{A\_27a}).(ap\ (ap\ (\mathsf{c\_2Emin\_2E\_3D}\ (2^{A\_27}$

Definition 5 *We define* $\mathsf{c\_2Ebool\_2E\_2F\_5C}$ *to be* $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap\ (\mathsf{c\_2Ebool\_2E\_21}\ 2)\ (\lambda V2t \in 2$

Let $c\_2Epair\_2EABS\_\_prod : \iota{\Rightarrow}\iota{\Rightarrow}\iota$ be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a{\Rightarrow}\forall A\_27b.nonempty\ A\_27b{\Rightarrow}c\_2Epair\_2EABS\_\_prod\ A\_27a\ A\_27b \in ((ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)^{((2^{A\_27b})^{A\_27a})}) \quad (3)$$

Definition 6 *We define* $\mathsf{c\_2Epair\_2E\_2C}$ *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda V0x \in A\_27a.\lambda V1y \in A\_27b.(ap\ (c\_2E$

Let $c\_2Epair\_2ESND : \iota{\Rightarrow}\iota{\Rightarrow}\iota$ be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a{\Rightarrow}\forall A\_27b.nonempty\ A\_27b{\Rightarrow}c\_2Epair\_2ESND\ A\_27a\ A\_27b \in (A\_27b^{(ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)}) \quad (4)$$

Let $c\_2Epair\_2EFST : \iota{\Rightarrow}\iota{\Rightarrow}\iota$ be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a{\Rightarrow}\forall A\_27b.nonempty\ A\_27b{\Rightarrow}c\_2Epair\_2EFST\ A\_27a\ A\_27b \in (A\_27a^{(ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)}) \quad (5)$$

Definition 7 *We define* c_2Epair_2EUNCURRY *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda A\_27c : \iota.\lambda V0f \in ((A\_27c^{A\_27b}$

Definition 8 *We define* c_2Ebool_2EF *to be* $(ap$ (c_2Ebool_2E_21 2) $(\lambda V0t \in 2.V0t))$.

Definition 9 *We define* c_2Erelation_2EEMPTY__REL *to be* $\lambda A_27a : \iota.\lambda V0x \in A_27a.\lambda V1y \in A_27a.$c_2Eb

Definition 10 *We define* c_2Ebool_2E_7E *to be* $(\lambda V0t \in 2.(ap\ (ap$ c_2Emin_2E_3D_3D_3E $V0t)$ c_2Ebool_2E

Definition 11 *We define* c_2Emin_2E_40 *to be* $\lambda A.\lambda P \in 2^A.$**if** $(\exists x \in A.p\ (ap\ P\ x))$ **then** $(the\ (\lambda x.x \in A \wedge$
of type $\iota \Rightarrow \iota$.

Definition 12 *We define* c_2Ebool_2E_3F *to be* $\lambda A\_27a : \iota.(\lambda V0P \in (2^{A\_27a}).(ap\ V0P\ (ap$ (c_2Emin_2E_40

Definition 13 *We define* c_2Erelation_2EWF *to be* $\lambda A\_27a : \iota.\lambda V0R \in ((2^{A\_27a})^{A\_27a}).(ap$ (c_2Ebool_2E_21

Let $ty\_2Esum\_2Esum : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty\_2Esum\_2Esum\ A0\ A1) \tag{6}$$

Let $c\_2Esum\_2EABS\_\_sum : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow c\_2Esum\_2EABS\_\_sum\ A\_27a\ A\_27b \in ((ty\_2Esum\_2Esum\ A\_27a\ A\_27b)^{(((2^{A\_27b})^{A\_27a})^2)}) \tag{7}$$

Definition 14 *We define* c_2Esum_2EINR *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda V0e \in A\_27b.(ap\ (c\_2Esum\_2EABS$

Definition 15 *We define* c_2Esum_2EINL *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda V0e \in A\_27a.(ap\ (c\_2Esum\_2EABS$

Definition 16 *We define* c_2Ebool_2E_5C_2F *to be* $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap$ (c_2Ebool_2E_21 2) $(\lambda V2t \in$

Assume the following.

$$True \tag{8}$$

Assume the following.

$$(\forall V0t1 \in 2.(\forall V1t2 \in 2.(((p\ V0t1) \Rightarrow (p\ V1t2)) \Rightarrow (((p\ V1t2) \Rightarrow (p\ V0t1)) \Rightarrow ((p\ V0t1) \Leftrightarrow (p\ V1t2)))))) \tag{9}$$

Assume the following.

$$(\forall V0t \in 2.(((p\ V0t) \Rightarrow False) \Rightarrow (\neg(p\ V0t)))) \tag{10}$$

Assume the following.

$$(\forall V0t \in 2.((\neg(p\ V0t)) \Rightarrow ((p\ V0t) \Rightarrow False))) \tag{11}$$

Assume the following.

$$(\forall V0t \in 2.(((True \Rightarrow (p\ V0t)) \Leftrightarrow (p\ V0t)) \wedge ((((p\ V0t) \Rightarrow True) \Leftrightarrow True) \wedge (((False \Rightarrow (p\ V0t)) \Leftrightarrow True) \wedge ((((p\ V0t) \Rightarrow (p\ V0t)) \Leftrightarrow True) \wedge (((p\ V0t) \Rightarrow False) \Leftrightarrow (\neg(p\ V0t)))))))) \tag{12}$$

Assume the following.

$$((\forall V0t \in 2.((\neg(\neg(p\ V0t)))\Leftrightarrow(p\ V0t)))\wedge(((\neg True)\Leftrightarrow False)\wedge ((\neg False)\Leftrightarrow True))) \tag{13}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a\Rightarrow(\forall V0x \in A\_27a.(\forall V1y \in A\_27a.((V0x = V1y)\Leftrightarrow(V1y = V0x)))) \tag{14}$$

Assume the following.

$$(\forall V0t \in 2.(((True\Leftrightarrow(p\ V0t))\Leftrightarrow(p\ V0t))\wedge((((p\ V0t)\Leftrightarrow True)\Leftrightarrow (p\ V0t))\wedge(((False\Leftrightarrow(p\ V0t))\Leftrightarrow(\neg(p\ V0t)))\wedge(((p\ V0t)\Leftrightarrow False)\Leftrightarrow(\neg(p\ V0t))))))) \tag{15}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a\Rightarrow(\forall V0P \in (2^{A\_27a}).((\neg(\exists V1x \in A\_27a.(p\ (ap\ V0P\ V1x))))\Leftrightarrow(\forall V2x \in A\_27a.(\neg(p\ (ap\ V0P\ V2x)))))) \tag{16}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a\Rightarrow(\forall V0P \in (2^{A\_27a}).(\forall V1Q \in (2^{A\_27a}).((\exists V2x \in A\_27a.((p\ (ap\ V0P\ V2x))\vee(p\ (ap\ V1Q\ V2x))))\Leftrightarrow ((\exists V3x \in A\_27a.(p\ (ap\ V0P\ V3x)))\vee(\exists V4x \in A\_27a.(p\ (ap\ V1Q\ V4x))))))) \tag{17}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a\Rightarrow(\forall V0P \in (2^{A\_27a}).(\forall V1Q \in 2.(((\exists V2x \in A\_27a.(p\ (ap\ V0P\ V2x)))\vee(p\ V1Q))\Leftrightarrow(\exists V3x \in A\_27a.((p\ (ap\ V0P\ V3x))\vee(p\ V1Q)))))) \tag{18}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a\Rightarrow(\forall V0P \in 2.(\forall V1Q \in (2^{A\_27a}).(((p\ V0P)\vee(\exists V2x \in A\_27a.(p\ (ap\ V1Q\ V2x))))\Leftrightarrow(\exists V3x \in A\_27a.((p\ V0P)\vee(p\ (ap\ V1Q\ V3x))))))) \tag{19}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a\Rightarrow(\forall V0P \in (2^{A\_27a}).(\forall V1Q \in 2.((\exists V2x \in A\_27a.((p\ (ap\ V0P\ V2x))\wedge(p\ V1Q)))\Leftrightarrow((\exists V3x \in A\_27a.(p\ (ap\ V0P\ V3x)))\wedge(p\ V1Q))))) \tag{20}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a\Rightarrow\forall A\_27b.nonempty\ A\_27b\Rightarrow(\forall V0x \in (ty\_2Epair\_2Eprod\ A\_27a\ A\_27b).(\exists V1q \in A\_27a. (\exists V2r \in A\_27b.(V0x = (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ A\_27a\ A\_27b) V1q)\ V2r))))) \tag{21}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow \forall A\_27c.\ nonempty\ A\_27c \Rightarrow (\forall V0f \in ((A\_27c^{A\_27b})^{A\_27a}).(\forall V1x \in A\_27a.(\forall V2y \in A\_27b.((ap\ (ap\ (\mathsf{c\_2Epair\_2EUNCURRY}\ A\_27a\ A\_27b\ A\_27c)\ V0f)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ A\_27a\ A\_27b)\ V1x)\ V2y)) = (ap\ (ap\ V0f\ V1x)\ V2y))))) \tag{22}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow (\forall V0R \in ((2^{A\_27a})^{A\_27a}).\ ((p\ (ap\ (\mathsf{c\_2Erelation\_2EWF}\ A\_27a)\ V0R)) \Rightarrow (\forall V1P \in (2^{A\_27a}).\ ((\forall V2x \in A\_27a.((\forall V3y \in A\_27a.((p\ (ap\ (ap\ V0R\ V3y)\ V2x)) \Rightarrow (p\ (ap\ V1P\ V3y)))) \Rightarrow (p\ (ap\ V1P\ V2x)))) \Rightarrow (\forall V4x \in A\_27a.(p\ (ap\ V1P\ V4x))))))) \tag{23}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow (p\ (ap\ (\mathsf{c\_2Erelation\_2EWF}\ A\_27a)\ (\mathsf{c\_2Erelation\_2EEMPTY\_\_REL}\ A\_27a))) \tag{24}$$

Assume the following.

$$(\forall V0t \in 2.((\neg(\neg(p\ V0t))) \Leftrightarrow (p\ V0t))) \tag{25}$$

Assume the following.

$$(\forall V0A \in 2.((p\ V0A) \Rightarrow ((\neg(p\ V0A)) \Rightarrow False))) \tag{26}$$

Assume the following.

$$(\forall V0A \in 2.(\forall V1B \in 2.(((\neg((p\ V0A) \vee (p\ V1B))) \Rightarrow False) \Leftrightarrow (((p\ V0A) \Rightarrow False) \Rightarrow ((\neg(p\ V1B)) \Rightarrow False))))) \tag{27}$$

Assume the following.

$$(\forall V0A \in 2.(\forall V1B \in 2.(((\neg((\neg(p\ V0A)) \vee (p\ V1B))) \Rightarrow False) \Leftrightarrow ((p\ V0A) \Rightarrow ((\neg(p\ V1B)) \Rightarrow False))))) \tag{28}$$

Assume the following.

$$(\forall V0A \in 2.(((\neg(p\ V0A)) \Rightarrow False) \Rightarrow (((p\ V0A) \Rightarrow False) \Rightarrow False))) \tag{29}$$

Assume the following.

$$(\forall V0p \in 2.(\forall V1q \in 2.(\forall V2r \in 2.(((p\ V0p) \Leftrightarrow ((p\ V1q) \Leftrightarrow (p\ V2r))) \Leftrightarrow (((p\ V0p) \vee ((p\ V1q) \vee (p\ V2r))) \wedge (((p\ V0p) \vee ((\neg(p\ V2r)) \vee (\neg(p\ V1q)))) \wedge (((p\ V1q) \vee ((\neg(p\ V2r)) \vee (\neg(p\ V0p)))) \wedge ((p\ V2r) \vee ((\neg(p\ V1q)) \vee (\neg(p\ V0p))))))))))) \tag{30}$$

Assume the following.

$$(\forall V0p \in 2.(\forall V1q \in 2.(\forall V2r \in 2.(((p\ V0p)\Leftrightarrow((p\ V1q)\wedge(p\ V2r)))\Leftrightarrow(((p\ V0p)\vee((\neg(p\ V1q))\vee(\neg(p\ V2r))))\wedge(((p\ V1q)\vee(\neg(p\ V0p)))\wedge((p\ V2r)\vee(\neg(p\ V0p))))))))) \tag{31}$$

Assume the following.

$$(\forall V0p \in 2.(\forall V1q \in 2.(\forall V2r \in 2.(((p\ V0p)\Leftrightarrow((p\ V1q)\vee(p\ V2r)))\Leftrightarrow(((p\ V0p)\vee(\neg(p\ V1q)))\wedge(((p\ V0p)\vee(\neg(p\ V2r)))\wedge((p\ V1q)\vee((p\ V2r)\vee(\neg(p\ V0p)))))))))) \tag{32}$$

Assume the following.

$$(\forall V0p \in 2.(\forall V1q \in 2.(\forall V2r \in 2.(((p\ V0p)\Leftrightarrow((p\ V1q)\Rightarrow(p\ V2r)))\Leftrightarrow(((p\ V0p)\vee(p\ V1q))\wedge(((p\ V0p)\vee(\neg(p\ V2r)))\wedge((\neg(p\ V1q))\vee((p\ V2r)\vee(\neg(p\ V0p)))))))))) \tag{33}$$

Assume the following.

$$(\forall V0p \in 2.(\forall V1q \in 2.(((p\ V0p)\Leftrightarrow(\neg(p\ V1q)))\Leftrightarrow(((p\ V0p)\vee(p\ V1q))\wedge((\neg(p\ V1q))\vee(\neg(p\ V0p))))))) \tag{34}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a\Rightarrow\forall A\_27b.nonempty\ A\_27b\Rightarrow(\forall V0ss \in (ty\_2Esum\_2Esum\ A\_27a\ A\_27b).((\exists V1x \in A\_27a.(V0ss = (ap\ (\mathsf{c\_2Esum\_2EINL}\ A\_27a\ A\_27b)\ V1x)))\vee(\exists V2y \in A\_27b.(V0ss = (ap\ (\mathsf{c\_2Esum\_2EINR}\ A\_27a\ A\_27b)\ V2y))))) \tag{35}$$

Theorem 1

$(\forall V0P \in ((2^{(ty\_2Epair\_2Eprod\ ((2^2)^2)\ (ty\_2Epair\_2Eprod\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2)\ (ty\_2Esum\_2Esum}$

$(((\forall V1n \in ty\_2Enum\_2Enum.(\forall V2conn \in ((2^2)^2).(\forall V3i \in$

$ty\_2Enum\_2Enum.(\forall V4j \in ty\_2Enum\_2Enum.(p\ (ap\ (ap\ V0P\ V1n$

$(ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ ((2^2)^2)\ (ty\_2Epair\_2Eprod\ (ty\_2Esum\_2Esu$

$ty\_2Enum\_2Enum\ 2)\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2)))\ V2co$

$(ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2)\ (ty\_2Esu$

$ty\_2Enum\_2Enum\ 2))\ (ap\ (\mathsf{c\_2Esum\_2EINL}\ ty\_2Enum\_2Enum\ 2)\ V3$

$(ap\ (\mathsf{c\_2Esum\_2EINL}\ ty\_2Enum\_2Enum\ 2)\ V4j)))))))))\wedge((\forall V5n \in$

$ty\_2Enum\_2Enum.(\forall V6conn \in ((2^2)^2).(\forall V7i \in ty\_2Enum\_2Enum$

$(\forall V8b \in 2.(p\ (ap\ (ap\ V0P\ V5n)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ ((2^2)^2)$

$(ty\_2Epair\_2Eprod\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2)\ (ty\_2Esum\_$

$ty\_2Enum\_2Enum\ 2)))\ V6conn)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ (ty\_2Esum\_2E$

$ty\_2Enum\_2Enum\ 2)\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2))\ (ap\ (\mathsf{c\_2Esu}$

$ty\_2Enum\_2Enum\ 2)\ V7i))\ (ap\ (\mathsf{c\_2Esum\_2EINR}\ ty\_2Enum\_2Enum$

$V8b)))))))))\wedge((\forall V9n \in ty\_2Enum\_2Enum.(\forall V10conn \in$

$((2^2)^2).(\forall V11a \in 2.(\forall V12j \in ty\_2Enum\_2Enum.(p$

$(ap\ (ap\ V0P\ V9n)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ ((2^2)^2)\ (ty\_2Epair\_2Epro$

$(ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2)\ (ty\_2Esum\_2Esum\ ty\_2Enum\_$

$2)))\ V10conn)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2$

$2)\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2))\ (ap\ (\mathsf{c\_2Esum\_2EINR}\ ty\_2Enum$

$2)\ V11a))\ (ap\ (\mathsf{c\_2Esum\_2EINL}\ ty\_2Enum\_2Enum\ 2)\ V12j)))))))))$

$(\forall V13n \in ty\_2Enum\_2Enum.(\forall V14conn \in ((2^2)^2).(\forall V15a \in$

$2.(\forall V16b \in 2.(p\ (ap\ (ap\ V0P\ V13n)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}$

$((2^2)^2)\ (ty\_2Epair\_2Eprod\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2$

$(ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2)))\ V14conn)\ (ap\ (ap\ (\mathsf{c\_2Epair\_}$

$(ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2)\ (ty\_2Esum\_2Esum\ ty\_2Enum\_$

$2))\ (ap\ (\mathsf{c\_2Esum\_2EINR}\ ty\_2Enum\_2Enum\ 2)\ V15a))\ (ap\ (\mathsf{c\_2Esum\_2E}$

$ty\_2Enum\_2Enum\ 2)\ V16b))))))))))))\Rightarrow(\forall V17v \in ty\_2Enum\_2Enum$

$(\forall V18v1 \in ((2^2)^2).(\forall V19v2 \in (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum$

$2).(\forall V20v3 \in (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2).(p\ (ap$

$(ap\ V0P\ V17v)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ ((2^2)^2)\ (ty\_2Epair\_2Eprod$

$(ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2)\ (ty\_2Esum\_2Esum\ ty\_2Enum\_$

$2)))\ V18v1)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2E$

$2)\ (ty\_2Esum\_2Esum\ ty\_2Enum\_2Enum\ 2))\ V19v2)\ V20v3))))))))$