Exercise solutions for Intermediate Logic by David Bostock

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2 Truth-Functors

2.1 Truth-Functors

2.1.1. The truth-tables are the followings.

(a)

$\begin{array}{c} {\rm First} \\ {\rm argument} \end{array}$	Second argument	Third argument	Value
$\overline{}$	Τ	Τ	F
${ m T}$	${ m T}$	F	F
${ m T}$	${ m F}$	${ m T}$	F
${ m T}$	${ m F}$	${ m F}$	Τ
F	${ m T}$	${ m T}$	F
F	${ m T}$	${ m F}$	T
${ m F}$	${ m F}$	${ m T}$	Т
F	F	F	F

(b)

b) -				
	First	Second	Third	Value
	$\operatorname{argument}$	$\operatorname{argument}$	$\operatorname{argument}$	varue
	Т	Τ	Τ	Т
	${ m T}$	${ m T}$	${ m F}$	${ m T}$
	${ m T}$	${ m F}$	${ m T}$	${ m T}$
	Τ	${ m F}$	\mathbf{F}	F
	\mathbf{F}	${ m T}$	${ m T}$	Τ
	F	${ m T}$	${ m F}$	F
	F	${ m F}$	${ m T}$	F
	F	F	F	F

(c)

)				
	First	Second	Third	Value
	$\operatorname{argument}$	$\operatorname{argument}$	$\operatorname{argument}$	varue
	Τ	Τ	Τ	F
	${ m T}$	${ m T}$	\mathbf{F}	F
	${ m T}$	\mathbf{F}	${ m T}$	F
	${ m T}$	\mathbf{F}	\mathbf{F}	F
	\mathbf{F}	${ m T}$	${ m T}$	Τ
	\mathbf{F}	${ m T}$	\mathbf{F}	Τ
	\mathbf{F}	\mathbf{F}	${ m T}$	Т
	F	F	F	Т

- 2.1.2. The three-place function has the same value as the two-place function if the value of the first arguments are the same. Whether a two-place function can be the *same* as a three-place function depends on the definition of *same*, but with regards to the strictest definition, no, because a three-place function needs 3 arguments always.
- 2.1.3. The truth-tables for all two-place functions are below. An n-place function has 2^n lines, and there are 2^{2^n} n-place functions, so all in all $2^n \cdot 2^{2^n} = 2^{n+2^n}$ lines.

Assuming the time it takes for me to write down each function is proportial to the number of lines, it would take $2^{3+2^3}/2^{2+2^2}=32$ times as much long.

(1)

First	Second	 Value
$\operatorname{argument}$	$\operatorname{argument}$	Varae
\overline{T}	Τ	Т
Τ	\mathbf{F}	T
\mathbf{F}	${ m T}$	T
F	${ m F}$	Γ

(2)

	First argument	Second argument	Value
-	T	T	Т
	Τ	F	Τ
	F	${ m T}$	Τ
	F	F	F

(3)

,			
	First	Second	 Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	T	Τ	Т
	${ m T}$	${ m F}$	Γ
	${ m F}$	${ m T}$	F
	${ m F}$	${ m F}$	Γ

(4)

i	First argument	Second argument	Value
	Τ	Τ	Т
	${ m T}$	\mathbf{F}	Т
	F	${ m T}$	F
	F	${ m F}$	F

(5)

First	Second	 Value
$\operatorname{argument}$	$\operatorname{argument}$	varue
${ m T}$	Τ	Т
${ m T}$	\mathbf{F}	F
${ m F}$	${ m T}$	Т
${ m F}$	F	Γ

(6)

First argument	Second argument	Value
${ m T}$	${ m T}$	Τ
${ m T}$	${ m F}$	F
${ m F}$	${ m T}$	T
${ m F}$	${ m F}$	F

(7)			
	First	Second	Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	T	Τ	Т
	${ m T}$	${ m F}$	F
	${ m F}$	${ m T}$	F
	${ m F}$	${ m F}$	Γ
(0)			l .

(8)			
	First	Second	Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	Т	Τ	Т
	${ m T}$	${ m F}$	F
	${ m F}$	${ m T}$	F
	${ m F}$	${ m F}$	F

(9)			
	First	Second	 Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	Τ	Τ	F
	${ m T}$	${ m F}$	Γ
	${ m F}$	${ m T}$	Т
	${ m F}$	${ m F}$	Γ

(10)			
	First	Second	Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	Т	Τ	F
	${ m T}$	${ m F}$	Γ
	${ m F}$	${ m T}$	T
	${ m F}$	${ m F}$	F

(11)			'
	First	Second	Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	T	Τ	F
	${ m T}$	${ m F}$	${ m T}$
	${ m F}$	${ m T}$	F
	${ m F}$	${ m F}$	Τ

 $\begin{array}{c|cccc} (12) & & & & & \\ \hline First & Second \\ argument & argument \\ \hline T & T & F \\ T & F & T \\ F & T & F \\ \hline F & F & F \\ \end{array}$

(13)			
	First	Second	Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	Τ	Τ	F
	${ m T}$	\mathbf{F}	F
	${ m F}$	${ m T}$	Γ
	${ m F}$	${ m F}$	Т
(14)			Į.

(14)			
	First	Second	 Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	${ m T}$	${ m T}$	F
	${ m T}$	${ m F}$	F
	${ m F}$	${ m T}$	Т
	${ m F}$	${ m F}$	F

(15)			
	First	Second	 Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	Τ	Τ	F
	${ m T}$	${ m F}$	F
	${ m F}$	${ m T}$	F
	F	${ m F}$	Γ

(16)			
	First	Second	Value
	$\operatorname{argument}$	$\operatorname{argument}$	varue
	Τ	${ m T}$	F
	${ m T}$	${ m F}$	F
	${ m F}$	${ m T}$	F
	${ m F}$	${ m F}$	F