ECE 322
SOFTWARE TESTING AND MAINTENANCE
Fall 2019

Assignment #3

Due date: Monday, October 21, 2019 by 3:00 PM
(return to the appropriate box- ECE 322 A1 - 2nd floor of DICE building)

Total: 50 points

Value 10 points

1. A credit union is planning to offer new financial products and considers clients being characterized by gender, city dwelling, and age group (under 25, between 25 and 65, and over 65). There are four new products: A, B, C, and D. Product A will appeal to male city dwellers. Product B will appeal to young (under 25) males. Product C will appeal to female in-between 25 and 65 who do not live in cities. Product D will appeal to all but males over 65. Construct a decision table for this problem. Answer the following:
(a) what is the maximal number of rules,
(b) simplify the table and show a collection of resulting test cases.

Solution
We identify attributes (input variables) and their values
Gender: M, F (2)
City dwelling: Y, N (2)
Age group: a- under 25, b –between 25 and 65, c – over 65 (3)
Maximal number of rules = 12

Rule#	1	2	3	4	5	6	7	8	9	10	11	12
gender	m	f	m	f	m	f	m	f	m	f	m	f
city	y	y	n	n	y	y	n	n	y	y	n	n
Age group	a	a	a	a	b	b	b	b	c	c	c	c
A	x				x				x			
B	x		x									
C								x				
D	x	x	x	x	x	x	x	x		x		x

Reduced table: rules 2, 6, 10 – two of the three conditions (gender and city dweller) are identical and all three values of age groups are present. The action part is the same. The rules are collapsed to a single rule (rule #2).

Rule#	1	2	3	4	5	6	7	8	9	10
gender	m	f	m	f	m	m	f	m	f	m
city	y	y	n	n	y	n	n	y	y	n
Age group	a	-	a	a	b	b	b	c	c	c
A	x				x			x		
B	x		x							
C							x			
D	x	x	x	x	x	x	x		x	

Further reduced rules are:

male & city dweller → A
male & under 25 → B
female & not city dweller & over 65 →C
not (male & over 65) →D

Value 10 points

2. Propose test cases using the EPC testing strategy and a weak *n* x 1 testing strategy for the subdomain described as follows

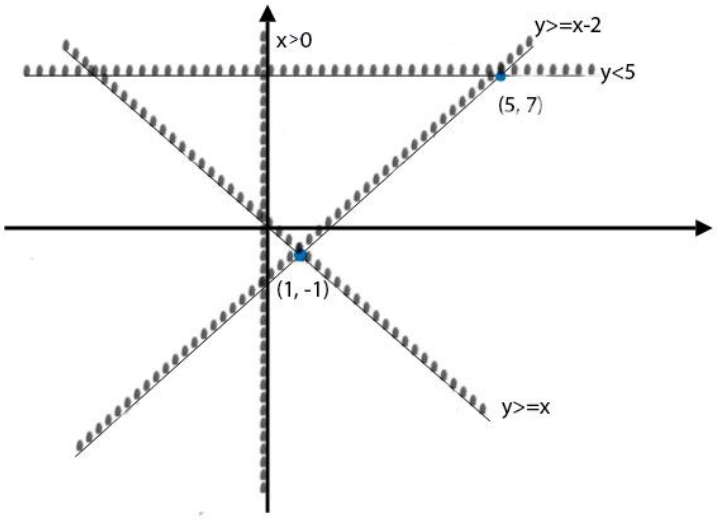
$$x+y\geq 0$$
$$y<5$$
$$x-y-2\leq 0$$
$$x>0$$

Solution

The subdomain is bounded by the linear functions

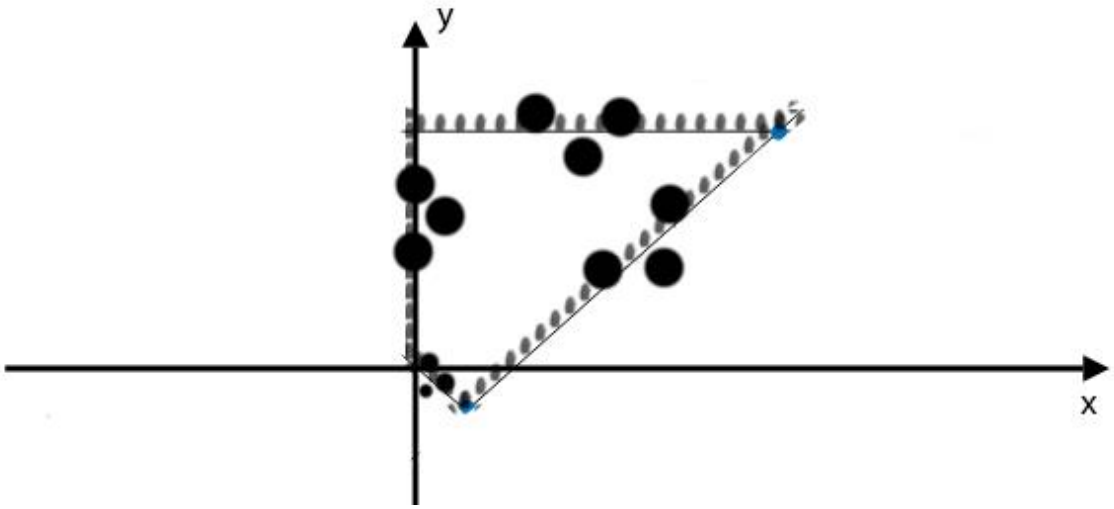
$y\geq -x$, $y<5$, $y\geq x-2$, $x>0$

as shown in the figure below



The EPC strategy places the test points at the corners of the rectangle (max-min values of the input variables *x* and *y*). The min and max for *x* is 0 and 7, respectively. The min and max for *y* is -1 and 5, respectively

The weak *n* x1 strategy requires the test cases shown below

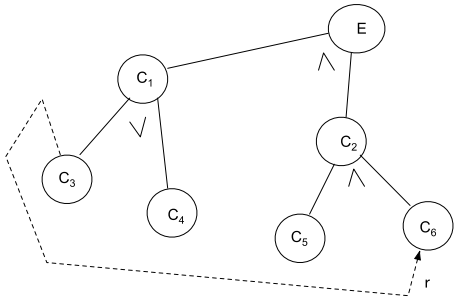


3. The program accepts three real positive numbers and determines whether these numbers form a triangle that is scalene, isosceles, or equilateral.
Show a cause-effect graph for testing this program.

Solution
Hint - refer to the lecture notes including the decision table

Value 10 points

4. For the following cause-effect graph, develop a suite of test cases. We require the output to be set to 1.



Solution

To have E equal to 1, we need both C1 and C2 set to 1. C2 =1 implies that C5 and C6 are equal 1. C1 equal to 1 requires an inputs (C3 =1 and C4 =0) or (C3 = 0 and C4=1).

Value 10 points

5. In realizing testing for a given configuration problem considered are the following components: printers -2, plug ins -3, browsers -3, operating systems -3, servers -3, monitors -2, e-mail systems-3, software packages of numeric optimization-3.
How much improvement is achieved when running combinatorial testing over testing all possible combinations?

Solution

The required orthogonal table $L_{18}(2^1 3^7)$ (see lecture notes) has 18 rows so the improvement (in terms of the smaller number of test cases) is 18 versus $2^2 * 3^6$ cases when running all combinations.
In general, we try to find the smallest orthogonal array that meet the requirements of the problem (viz. the number of columns and the number of values in the corresponding columns) and choose the one that has the minimal number of rows.