ECE 322
SOFTWARE TESTING AND MAINTENANCE
Fall 2015

Assignment #3

Due date: Monday, October 19, 2015 by 3:00 PM
(return to the appropriate box- 2nd floor of ECERF building)

Total: 30 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 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:
(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) as 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

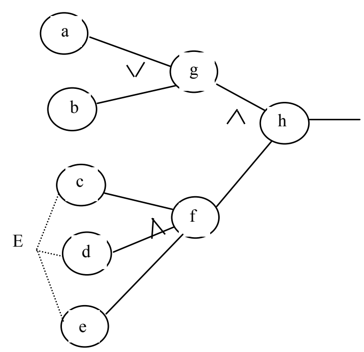
Rule#	1	2	3	4	5	6	7	8	9	10	11	12
gender	m	f	m	f	m	f	m	f	m	f	m	f
city	y	y	n	n	y	y	n	n	y	y	n	n
Age group	a	a	a	a	b	b	b	b	c	c	c	c
A	x				x				x			
B	x		x									
C								x				
D	x	x	x	x	x	x	x	x		x		x

Reduced table: rules 2, 6, 10 – two of the three conditions (gender and city dwellere) 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).

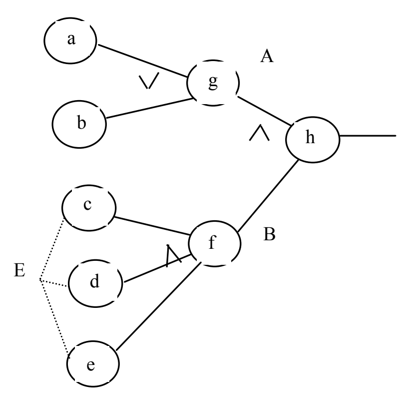
Rule#	1	2	3	4	5	7	8	9	10	11
gender	m	f	m	f	m	m	f	m	f	m
city	y	y	n	n	y	n	n	y	y	n
Age group	a	a	a	a	b	b	b	c	c	c
A	x				x			x		
B	x		x							
C							x			
D	x	x	x	x	x	x	x		x	

Value 10 points

2. For the following cause-effect graph, develop a suite of test cases.



Solution



If we require output =1, this cannot be satisfied as there might be a problem with the specification converted into this cause-effect graph. Given the constraint (E), B can never produce value =1.

If we require output =0, we have the following cases:

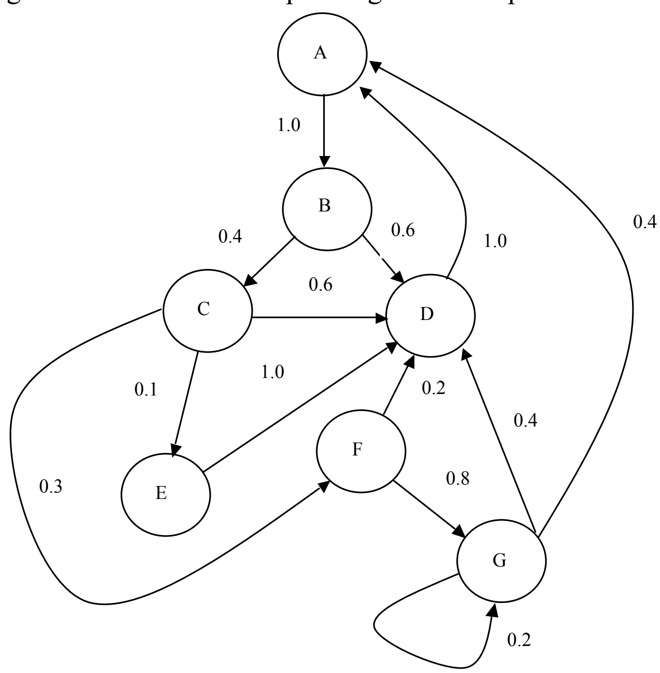
AB =00 which produces a=0 b =0 c =0 d=1 e=0

AB =01 Not feasible as indicated above (B cannot be 1)

AB = 10 a=1 b=0 c =0 d =1 e =0

Value 10 points

3. The behavior of a small text editor can be represented in the form of the finite state machine shown below. The figure includes the corresponding transition probabilities between the states.



Enumerate an order in which you would like to test the individual states. Justify your answer.

Solution. We are concerned with the *stationary* probabilities associated with the corresponding states. They are obtained by solving a system of linear equations

$p_A= p_D+ 0.4p_G$
$p_B=p_A$
$p_C=0.4p_B$
$p_D=0.6p_B+0.6p_C+p_E+0.2p_F+0.4p_G$
$p_E=0.1p_C$
$p_F=0.3p_C$
$p_G=0.2p_G+0.8p_F$

The last equation in this system is dropped (otherwise the system is linearly dependent) and p_G is determined from the relationship
$p_A+ p_B +\ldots +p_G =1$ that is $p_G = 1- p_A -p_B -\ldots- p_F$ replaces p_G in the above reduced system of equations

$p_A = p_D + 0.4(1 - p_A - p_B - \ldots - p_F)$
$p_B = p_A$
$p_C = 0.4 p_B$
$p_D = 0.6 p_B + 0.6 p_C + p_E + 0.2 p_F + 0.4(1 - p_A - p_B - \ldots - p_F)$
$p_E = 0.1 p_C$
$p_F = 0.3 p_C$

In the sequel, we rewrite the above equations in the following form

A**p** =**x**

Where A determined on a basis of these equations above reads as follows

$$A := \begin{pmatrix} 1.4 & 0.4 & 0.4 & -0.6 & 0.4 & 0.4 \\ 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0.4 & -1 & 0 & 0 & 0 \\ -0.4 & 0.2 & 0.2 & -1.4 & 0.6 & -0.2 \\ 0 & 0 & 0.1 & 0 & -1 & 0 \\ 0 & 0 & 0.3 & 0 & 0 & -1 \end{pmatrix}$$

And **x** is a vector of constants

$$\mathbf{x} = \begin{bmatrix} 0.4 \\ 0.0 \\ 0.0 \\ -0.4 \\ 0 \\ 0 \end{bmatrix}$$

After solving it with regard to **p**, $p = A^{-1}$ **x** we have

$$\mathbf{p} = \begin{bmatrix} 0.275 \\ 0.275 \\ 0.11 \\ 0.262 \\ 0.011 \\ 0.033 \\ 0.033 \end{bmatrix}$$

The states characterized by the highest probability are tested first. Thus the order of states to be tested is: A, B, D, C, F, G, E.