**Problem 1**: **A**ssume that {Table 1, Table 2} represents distributed information system with Tables 1&2 accepting the same ontology. Use Table 2 to build attribute g in Table 1.

 a b c d f

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x1 |  1 |  1 |  2 |  1 |  1 |
| x2 |  3 |  1 |  2 |  2 |  0 |
| x3 |  1 |  2 |  2 |  1 |  2 |
| x4 |  2 |  1 |  1 |  2  |  1 |
| x5 |  3 |  1 |  2 |  2 |  0 |
| x6 |  3 |  2 |  1 |  2 |  1 |
| x7 |  2 |  2 |  1  |  2 |  2 |

Table 1.

 a e c d g

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| y1 |  1 |  1 |  2 |  1 |  1 |
| y2 |  2 |  1 |  2 |  2 |  0 |
| y3 |  1 |  2 |  2 |  1 |  1 |
| y4 |  1 |  1 |  1 |  1  |  1 |
| y5 |  3 |  1 |  2 |  2 |  0 |
| y6 |  3 |  1 |  1 |  2 |  1 |
| y7 |  3 |  2 |  2 |  2 |  0 |

Table 2.

Solution: g0\*={y2,y5,y7}, g1\*={y1,y3,y4,y6}

a1\*={y1,y3,y4}<g1\*, a3\*={y5,y6,y7}, c2\*={y1,y2,y3,y5,y7}, c1\*={y4,y6}<g1\*, d1\*={y1,y3,y4}<g1\*, d2\*={y2,y5,y6,y7},

a3.c2\*={y5,y7} < g0\*, a3.d2\*=a3\*, c2.d2\*={y7}<g0\*

a1->g1, s=3, c=1; a3->g1, s=1, c=1/3; c2->g1, s=2, c=2/5;

c1->g1, s=2, c=1; d1->g1, s=3, c=1; d2->g1, s=1, c=1/4

a2\*={y2} < g0\*, a3\*={y5,y6,y7} , c2\*={y1,y2,y3,y5,y7} , c1\*={y4,y6}

d2\*={y2,y5,y6,y7}, a3.c2\*={y5,y7}<g0\*, a3.d2\*=a3\*, c2.d2\*={y2,y5,y7}<g0\*,

Rules: a2->g0 s=1, c=1; a3->g0 s=2, c=2/3; c2->g0, s=3, c=3/5; d2->g0, s=3 , c=3/4; a3.c2->g0, s=2, c=1; c2.d2->g0, s=3, c=1.

a1->g1, s=3, c=1; a3->g1, s=1, c=1/3; c2->g1, s=2, c=2/5;

c1->g1, s=2, c=1; d1->g1, s=3, c=1; d2->g1, s=1, c=1/4

Construction of attribute g in Table 2.

 a b c d f g

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| x1 |  1 |  1 |  2 |  1 |  1 | (g0,3\*3/5), (g1,3\*1+2\*2/5+3\*1) |
| x2 |  3 |  1 |  2 |  2 |  0 | (g0,2\*2/3+3\*3/5+3\*3/4+2+3),(g1,1/3+2\*2/5+1/4) |
| x3 |  1 |  2 |  2 |  1 |  2 | (g0,3\*3/5),(g1,3+2\*2/5+3\*1) |
| x4 |  2 |  1 |  1 |  2  |  1 | (g0,1+3\*3/4)(g1,2+1\*1/4) |
| x5 |  3 |  1 |  2 |  2 |  0 | (g0,2\*2/3+3\*3/5+3\*3/4+2+3),(g1,2\*2/5+1\*1q/4) |
| x6 |  3 |  2 |  1 |  2 |  1 | (g0,2\*2/3+3\*3/4),(g1,1/3+2+1/4) |
| x7 |  2 |  2 |  1  |  2 |  2 | (g0,1+3\*3/4),(g1,2+1/4) |

Table 1.

Rules: a2->g0 s=1, c=1; a3->g0 s=2, c=2/3; c2->g0, s=3, c=3/5; d2->g0, s=3 , c=3/4; a3.c2->g0, s=2, c=1; c2.d2->g0, s=3, c=1.

a1->g1, s=3, c=1; a3->g1, s=1, c=1/3; c2->g1, s=2, c=2/5;

c1->g1, s=2, c=1; d1->g1, s=3, c=1; d2->g1, s=1, c=1/4

 a b c d f g

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| x1 |  1 |  1 |  2 |  1 |  1 | (g0,9/43)(g1,34/43) |
| x2 |  3 |  1 |  2 |  2 |  0 | (g0,2\*2/3+3\*3/5+3\*3/4+2+3),(g1,1/3+2\*2/5+1/4) |
| x3 |  1 |  2 |  2 |  1 |  2 | (g0,9/43)(g1,34/43) |
| x4 |  2 |  1 |  1 |  2  |  1 | (g0,1+3\*3/4)(g1,2+1\*1/4) |
| x5 |  3 |  1 |  2 |  2 |  0 | (g0,2\*2/3+3\*3/5+3\*3/4+2+3),(g1,2\*2/5+1\*1q/4) |
| x6 |  3 |  2 |  1 |  2 |  1 | (g0,2\*2/3+3\*3/4),(g1,1/3+2+1/4) |
| x7 |  2 |  2 |  1  |  2 |  2 | (g0,13/22),(g1,9/22) |

Table 1.

**Problem 2**

Systems S1, S2 are defined below. Construct new attribute e in S1 using knowledge hidden in S2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | a | b | c | d |
| x1 | a1 | b2 | c1 | d1 |
| x2 | a2 | b2 | c1 | d2 |
| x3 | a1 | b1 | c2 | d2 |
| x4 | a2 | b2 | c2 | d2 |

System S1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | c | d | e | f |
| x2 | c1 | d2 | e1 | f2 |
| x5 | c2 | d1 | e2 | f2 |
| x6 | c2 | d1 | e2 | f2 |
| x7 | c1 | d3 | e2 | f1 |
| x8 | c3 | d1 | e1 | f1 |

System S2

**Solution:**

e1\*={2,8}, e2\*={5,6,7}

c1\*={2,7}, c2\*={5,6} < e2\*, c3\*={8}<e1\*,

d1\*={5,6,8}, d2\*={2}<e1\* d3\*={x7}<e2\*

c2->e2 sup=2, conf=1; c3->e1 sup=1 conf=1 d2-> e1 sup=1, conf=1

d3-> e2 sup=1, conf=1; c1-> e1 sup=1 conf=1/2 ; c1-> e2 sup=1, conf =1/2

d1 -> e1 sup=1 conf = 1/3; d1->e2 sup=2, conf=2/3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | a | b | c | d | e |
| x1 | a1 | b2 | c1 | d1 | (e1, 1\*1/2 +1\*1/3), (e2, 1\*1/2+2\*2/3) |
| x2 | a2 | b2 | c1 | d2 | (e1,1\*1+1\*1/2), (e2,1\*1/2) |
| x3 | a1 | b1 | c2 | d2 | (e1,1\*1), (e2,2\*1) |
| x4 | a2 | b2 | c2 | d2 | (e1,1\*1), (e2,2\*1) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | a | b | c | d | e |
| x1 | a1 | b2 | c1 | d1 | (e1, 5/16), (e2, 11/16) |
| x2 | a2 | b2 | c1 | d2 | (e1,3/4), (e2,1/4) |
| x3 | a1 | b1 | c2 | d2 | (e1,1/3), (e2,2/3) |
| x4 | a2 | b2 | c2 | d2 | (e1,1/3), (e2,2/3 ) |

Normalizing attribute e:

(e1, ½ + 1/3) - (e2, ½+4/3)

(e1, 3/6 + 2/6 = 5/6) - (e2,3/6 + 8/6 = 11/6)

(e1, 5) - (e2, 11)