

DECISION ANALYSIS – SHORT EXERCISES V – ROUGH SET APPROACH

I. Consider the below decision table concerning seven objects (O1-O7) with a set of condition attributes $P = \{C1, C2, C3\}$ and a decision attribute D. Compute the lower and upper approximations of classes A and B and the respective boundaries. Compute the accuracy and quality of approximation for each class. Compute the quality of approximation of classification. Indicate reducts and the core.

Object	C1	C2	C3	D	For class A: $\underline{P}(A) = \{O2, O3, O5\}$ $\overline{P}(A) = \{O2, O3, O5, O7, O1\}$ $Bn_P(A) = \{O7, O1\}$ $\alpha_P(A) = \frac{ \underline{P}(A) }{ \overline{P}(A) } = \frac{3}{5}$ $\gamma_P(A) = \frac{ \underline{P}(A) }{ A } = \frac{3}{4}$	For class B: $\underline{P}(B) = \{O4, O6\}$ $\overline{P}(B) = \{O1, O7, O4, O6\}$ $Bn_P(B) = \{O7, O1\}$ $\alpha_P(B) = \frac{ \underline{P}(B) }{ \overline{P}(B) } = \frac{1}{2}$ $\gamma_P(B) = \frac{ \underline{P}(B) }{ B } = \frac{2}{3}$ For two classes (A and B): $Bn_P(A) = Bn_P(B)$	Quality of approximation of classification: $\gamma_P(CI) = \frac{ \underline{P}(A) + \underline{P}(B) }{ U } = \frac{5}{7}$ Reducts: $\gamma_{C1}(CI) = \gamma_{C3}(CI) = 0$ $\gamma_{C2}(CI) = 2/7$. $\gamma_{\{C1, C2\}}(CI) = 5/7$. $\gamma_{\{C1, C3\}}(CI) = 3/7$. $\gamma_{\{C2, C3\}}(CI) = 5/7$. Reducts: $\gamma_{\{C1, C2\}}(CI)$, $\gamma_{\{C2, C3\}}(CI)$ Core: C2
O1	a	1	+	B			
O2	a	3	-	A			
O3	a	2	+	A			
O4	b	1	-	B			
O5	a	2	+	A			
O6	b	3	+	B			
O7	a	1	+	A			

II. Consider the below decision table with a set of condition attributes $P = \{C, D, E\}$ and a decision attribute DEC. It is known that $\underline{P}(F)=\{a, b, c, d\}$, $\underline{P}(G)=\{f, g\}$, $\overline{P}(F)=\{a, b, c, d, e, i\}$, $\overline{P}(H)=\{e, h, i, j\}$, and $Bn_P(F)=Bn_P(H)=\{e, i\}$. Induce the following minimal sets of rules from the above approximations: certain rules for class G, possible rules for class F, and approximate rules for classes F and H. The rules need to have the following syntax: "if (conjunction of elementary conditions), then decision".

Object	C	D	E	DEC	Certain rule for class G: if (C == T AND D == Y), then G Possible rules for class F: if (C == Y AND E == A), then possibly F if (E == B), then possibly F Approximate rules for classes F and H: if (C == Y AND E == K), then F OR H
a	Y	T	A	F	
b	Y	Y	A	F	
c	Y	Y	B	F	
d	K	K	B	F	
e	Y	Y	K	F	
f	T	Y	Y	G	
g	T	Y	T	G	
h	T	K	K	H	
i	Y	Y	K	H	
j	T	K	Y	H	