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DECISION ANALYSIS – SHORT EXERCISES II – ELECTRE TRI-B

I. Consider two alternatives a and e, and a single boundary class profile b_t. They are evaluated on two criteria g_1 and g_2 (the performances are provided in the below table) with the following specification of preference orders as well as intra- and inter-criteria parameters:

- g_1 – gain, weight $w_1=2$, indifference threshold $q_1(b_t)=10$, preference threshold $p_1(b_t)=50$, and veto threshold $v_1(b_t)=100$;
- g_2 – cost, weight $w_2=3$, indifference threshold $q_2(b_t)=0$, preference threshold $p_2(b_t)=10$, and veto threshold $v_2(b_t)=20$.

For pairs (a,b_t), (b_t,a), (e,b_t), (b_t,e), compute the marginal concordance c_j and discordance D_j indices, comprehensive concordance indices C, and outranking credibilities σ. When considering the credibility threshold $\lambda = 0.6$, verify the truth of outranking relation S for all considered pairs and indicate which relation (>, <, ?, I) holds for them.

	$g_1 \uparrow$	$g_2 \downarrow$	$c_1(a,b_t) =$	1	$D_1(a,b_t) =$	0	$c_1(b_t,a) =$	1	$D_1(b_t,a) =$	0	Outranking	
a	145	40	$c_2(a,b_t) =$	0	$D_2(a,b_t) =$	1	$c_2(b_t,a) =$	1	$D_2(b_t,a) =$	0	aS^Cb_t	b_tSa
e	240	20	$C(a,b_t) =$	$(2\cdot1+ 3\cdot0)/5 = 0.4$			$C(b_t,a) =$	$(2\cdot1+ 3\cdot1)/5 = 1$			Relation	
b_t	150	15	$\sigma(a,b_t) =$	$0.4\cdot(1-1)/(1-0.4) = 0$			$\sigma(b_t,a) =$	1			$a < b_t$	

$c_1(e,b_t) =$	1	$D_1(e,b_t) =$	0	$c_1(b_t,e) =$	0	$D_1(b_t,e) =$	1	Outranking	
$c_2(e,b_t) =$	1	$D_2(e,b_t) =$	0	$c_2(b_t,e) =$	1	$D_2(b_t,e) =$	0	b_tSe	eS^Cb_t
$C(e,b_t) =$	$(2*1 + 3*1)/5 = 1$			$C(b_t,e) =$	$(2*0 + 3*1)/5 = 0.6$			Relation	
$\sigma(e,b_t) =$	1			$\sigma(b_t,e) =$	$0.6*(1-1)/(1-0.6) = 0$			$e > bt$	

II. Consider alternatives a_1 - a_{10} that are compared against boundary class profiles $b_0 - b_4$. Class C_h is defined by a lower profile b_{h-1} and an upper profile b_h. Thus, four classes $C_1 - C_4$ are considered overall, where C_4 is the most preferred class and C_1 is the least preferred. For alternatives $a_1 - a_6$ determine the class assignments according to the pessimistic and optimistic rules of ELECTRE TRI-B. The interpretation of relations in the table is as follows: > (preference), < (inverse preference), I (indifference), and ? (incomparability). For alternatives $a_7 - a_{10}$, fill in the relations that would imply the provided assignments.

Alternative	Profiles					Class assignments	
	b_0	b_1	b_2	b_3	b_4	Pessimistic	Optimistic
a_1	>	>	<	<	<	C_2	C_2
a_2	>	?	<	<	<	C_1	C_2
a_3	>	>	I	I	<	C4	C4
a_4	>	?	?	?	<	C1	C4
a_5	>	>	>	>	<	C4	C5
a_6	I	<	<	<	<	C1	C1
a_7	>	>	I	<	<	C_3	C_3
a_8	>	>	<	<	<	C_2	C_2
a_9	>	?	?	<	<	C_1	C_3
a_{10}	>	>	I	I	<	C_4	C_4