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1. Is the following logical statement a tautology? 2

[(P→ Q ) ˄ ( (Q˄R)→ S) ]→( P →S)

2. When the following statements are consistent 2

3. Give an example of binary relation satisfying completeness and not reflexivity and not transitivity 2

4. Give an example of individual preference relation over the alternatives {x, y, z, u} such that the choice set is non-empty and the preference relation is not quasi-transitive. 2

5. Find the Pareto optimal state for the following profile of individual preferences of three individuals. The left option is the most preferred and right option is least preferred. The ranking of preference is from left to right. 2

Individual 1: t z y x

Individual 2: z x t y

Individual 3: t y z x

6. Suppose there are four individuals and six alternatives. Give an example of profile of individual preference ordering or ranking that generates a cycle in social preference relation when simple majority rule is used. 2

7. Taking three alternatives and four individuals construct an example of individual preference ordering or ranking profile such that the alternatives which rank first ( first position) based on Plurality method and is in the second position ( second rank) when Borda count is used. 2

8. Find a dictator in the following profile of individual preferences. Left most option is most preferred and the right most option is least preferred. The ranking of preference is from left to right. 3

Individual 1: x z y t

Individual 2: z t x y

Individual 3: z x t y

9. Suppose there are three individuals and five alternatives. Suppose Individual 1 is decisive over x against y and Individual 2 is decisive over u against v. Give an example of individual preference profile so that the social choice set is non-empty. 3