

## MA 391 ASSIGNMENT # 1

Answers to problems may be handwritten.

- (1) Consider the voter preferences below.

Number of voters	18	12	10	9	4	2
First choice	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>E</i>
Second choice	<i>D</i>	<i>E</i>	<i>B</i>	<i>C</i>	<i>B</i>	<i>C</i>
Third choice	<i>E</i>	<i>D</i>	<i>E</i>	<i>E</i>	<i>D</i>	<i>D</i>
Fourth choice	<i>C</i>	<i>C</i>	<i>D</i>	<i>B</i>	<i>C</i>	<i>B</i>
Fifth choice	<i>B</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>

Determine which candidate wins the election using 4 different election systems: plurality, sequential runoff, Borda count, and Condorcet. Which system do you think is best?

- (2) In a plurality system, is it possible for a candidate to win the election, even if the majority of voters rank that candidate as their least favorite? Explain why or why not.
- (3) Given an arbitrary system for determining the winner of an election (not necessarily one of the ones discussed in class), explain how you could use it to determine a ranking of the candidates, from first to last.
- (4) For each of the relations below, is it a total ordering? Is it a partial ordering? Explain why or why not.
- (a)  $A \geq_v B$  – Voter  $v$  prefers candidate  $A$  to candidate  $B$ .
  - (b)  $A \nabla B$  – Candidate  $A$  is either taller than or older than candidate  $B$ .
  - (c)  $A \vdash B$  – Candidate  $A$  is both taller and older than candidate  $B$ .
  - (d)  $A \heartsuit B$  – Candidate  $A$  loves candidate  $B$ .
  - (e)  $A \clubsuit B$  – Candidate  $A$  is precisely as smelly as candidate  $B$ .