Problem 1 (6 points)

Problem 2 (11 points)

- Subdivision (a) to (c) carry 2 points each

- Subdivisions (d) and (e) carry 2.5 points each

Problem 3 (10 points)

- Subdivision (a) carries 3 points

- Subdivision (b) carries 7 points

  - (i) carries 2 points
  - (ii) and (iii) carry 2.5 points each

Problem 4 (8 points)

- Each subdivision carries 2 points

Problem 5 (5 points)

Common Mistakes

- For problem 1, since you are asked to prove an iff statement you need to argue both directions to give a complete proof.

- For problem 2, a relation being symmetric does not imply that it is not antisymmetric. Asymmetry is different from antisymmetry. Relations 2 and 4 are both symmetric and anti-symmetric. Hence, in order to conclude that a relation is no an order, you need to explicitly prove that it is not antisymmetric. Stating that it is symmetric and hence not ordered is not a valid argument.

- For problem 2, part (b), some students only considered the case where x denotes the empty set for determining reflexivity, and thus came to an incorrect conclusion that teh relation is reflexive.

- For problem 2 part (c), some students stated that the relation was antisymetric using $|x| = |y|$ as the antecedent for the antisymmetric condition instead of $x = y$.

- For problem 2, parts (d) and (e), in addition to proving that they are equivalence relations you also need to give the equivalence classes.

- For problem 3, several people did not take the if and only if into consideration, which led to ignoring the set of strings with more than k ones as an equivalence class in part (iii).