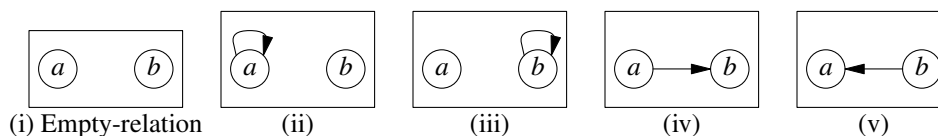


Practice Questions for Thursday's Short Quiz

Shown below are five relations (in the digraph form) on $X = \{a, b\}$.

- Of these, (i)-(iii) are symmetric and none is reflexive.
- We can say the relations in (ii)-(iii) have the same "structure" and they differ only in the way nodes (circles) are labeled. In otherwords, if we remove the node labels, then they become identical.

The same remark holds for relations in (iv)-(v).



1. Draw the digraphs (without node labels) for all possible structures for relations on $X = \{a, b\}$. Also, for each digraph, use the labels R (for reflexive) and S (for symmetric) to indicate the properties that hold for the relation.
2. For each structure in Problem 1, indicate the number of relations with that structure.
3. Verify that for $n = |X| = 2$ there are 2^{n^2} relations on X and that 2^{n^2-n} of these relations are reflexive, $2^{n(n+1)/2}$ are symmetric, and $2^{n(n-1)/2}$ are both reflexive and symmetric.