

EE4001/IM2001 Software Engineering Tutorial 4

1. Draw a class diagram to model the following structural properties in the Order Processing System in a company:
 Customers place orders with the company to purchase products that are sold by the company. A customer may have none or multiple orders placed. Each order is always placed by one customer. It may have single or multiple order items. Each item is to purchase one product. An order item could be fully fulfilled, partially fulfilled or outstanding (completely unfulfilled). Periodically, an invoice is raised to bill the customer for the order items that have been fully fulfilled.
2. **A Diagnostic Test on the Basic OO Concepts:** Based on the class diagram shown in Figure 1 and 2, state the correctness of the following statements and justify your answers:

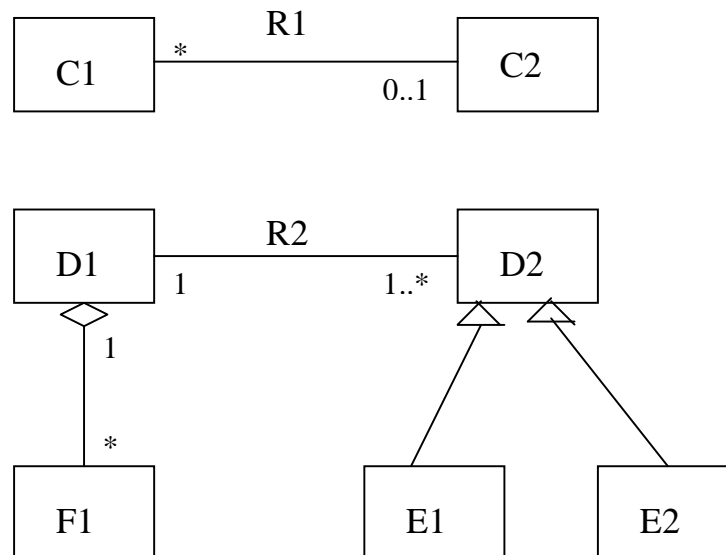


Figure 1. A class diagram

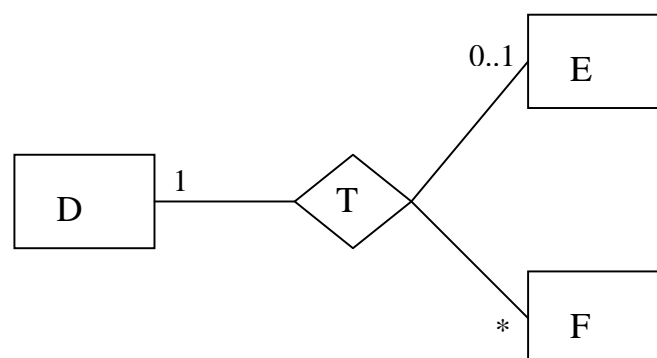


Figure 2. A class diagram

- (i) In R1, each C1 object is associated with at most one C2 object.
- (ii) In R1, different C1 instances may associate to the same C2 instance.
- (iii) Each instance of R1 associates a C1 object with a C2 object.
- (iv) Some instances of F1 may not be part-of any D1 instance.
- (v) Each instance of E1 is an instance of D2.
- (vi) Each instance of D2 is an instance of E1 or E2.
- (vii) We can add multiplicity notations to the generalization between D2, E1 and E2.
- (viii) Each instance of E1 associates with one instance of D1 under the association R2.
- (ix) When the sets of instances of D, E and F are {d1, d2}, {e1} and {f1, f2} respectively, {(d1, e1, f1), (d2, e1, f2)} is a possible set of R instances.
- (x) When the sets of instances of D, E and F are {d1, d2}, {e1, e2} and {f1, f2} respectively, {(d2, e1, f1), (d2, e1, f2), (d2, e2, f1), (d1, e2, f2)} is a possible set of R instances

3. In Figure 3, if B has 1000, what is the number of A instances?

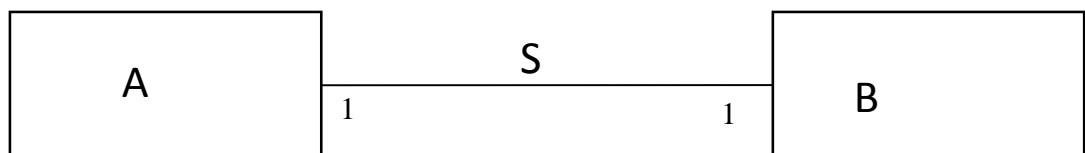


Figure 3. A class diagram

4. In Figure 4, if B has 9000, what is the number of A instances?

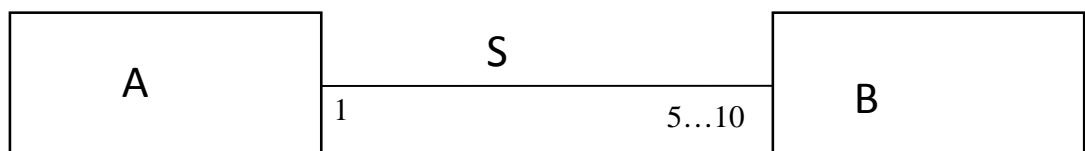


Figure 4. A class diagram

5. In Figure 5,
- If Y has 1000 instances, what is the minimum number of X instances?
 - If X has 3000 instances, what are the maximum numbers of Y and Z instances?

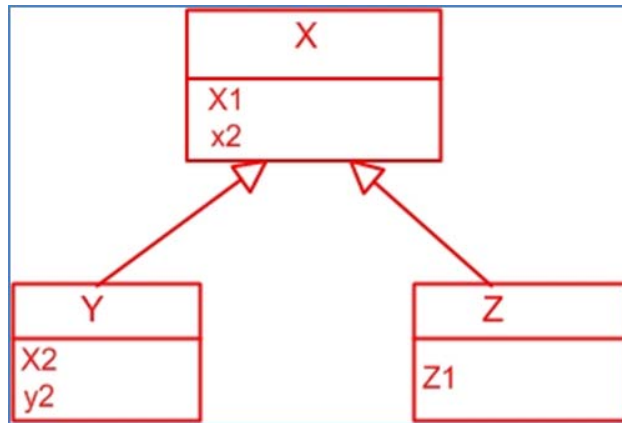


Figure 5. A generalization

6. In the class diagram shown in Figure 6, let the number of instances of G1, G2, G3 and G4 be m, n, p and q (all greater than zero) respectively. Prove that $n \geq 2 \cdot m$ and $m \geq p$.

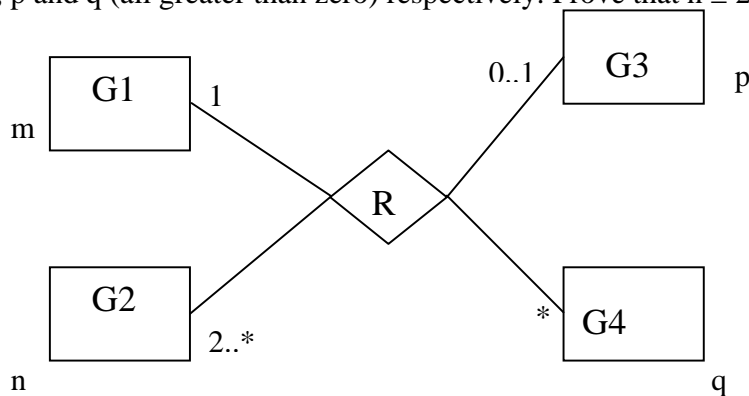


Figure 6. A class diagram