

INF223 Category Theory and Diagrammatic Modelling Spring 2011

— Compulsory Exercise Set 3 , Deadline 03.05.2011 **12:15** —
(You can deliver your solutions by email to me, in a box beside the secretary at 4th floor, or in the Lecture)

You can discuss the exercises in groups, but every student should deliver her/his own solution!

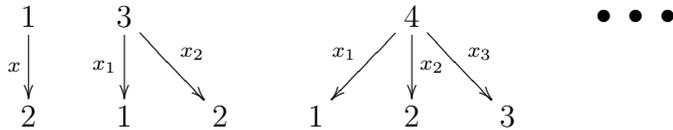
- (a) Describe how to construct the limit **and** the colimit of an arbitrary diagram $\delta : I \rightarrow \mathbf{Set}$ (with $\delta(a) = f$ and $\delta(1) = A$) in the category \mathbf{Set} :

$$\text{diagram } \delta : f \begin{array}{c} \circlearrowleft \\ \circlearrowright \end{array} A \qquad \text{shape } I : a \begin{array}{c} \circlearrowleft \\ \circlearrowright \end{array} 1$$

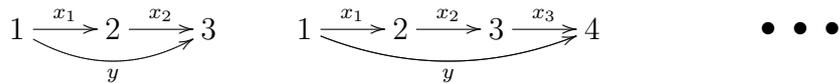
- (b) Compute the limit and the colimit of the special diagram with $A = \{1, 2, 3, 4\}$ and $f : A \rightarrow A$ given by $f(1) = 1, f(2) = 3, f(3) = f(4) = 4$.

- In the lecture we have outlined how ER diagrams can be described as Σ_{ER} -specifications for a certain (diagram predicate) signature Σ_{ER} . Let's assume now that Σ_{ER} includes the following predicate symbols:

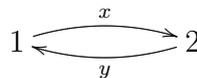
- “jointly injective/mono” [*ji*] with the possible arities



- “composition” [*comp*] with the possible arities



- “inverse” [*inv*] with arity



- “surjective/cover” [*surj*] with the arity $1 \xrightarrow{x} 2$

Describe now the ER diagrams in Figure 2.10 and Figure 2.11 in the book “Database Management Systems” by Ramakrishnan/Gehrke as Σ_{ER} -specifications. Thereby we assume that the attributes in Figure 2.10 and Figure 2.11 do have the following types:

- ssn, lot, since, budget, did, cost, age: **Int**

- name, dname, pname: **Str**.

Hint:

- We ignore the classification of the nodes into “entity”, “relation” and “attribute” nodes, respectively.
- You don't need to describe the diagrams in your specifications explicitly as graph homomorphisms. You should, however, list the diagrams for each predicate symbol.