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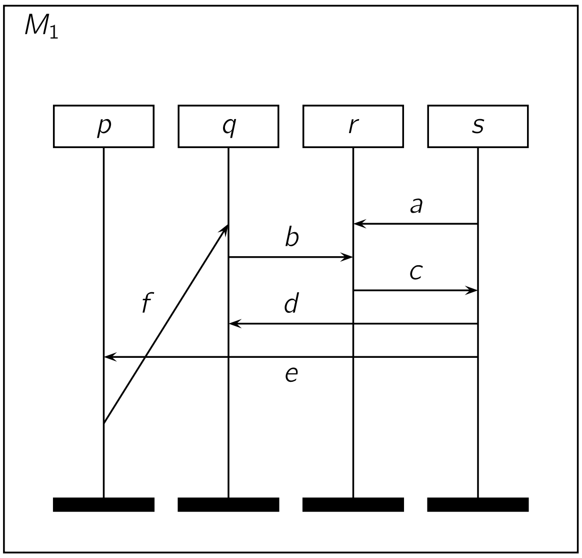
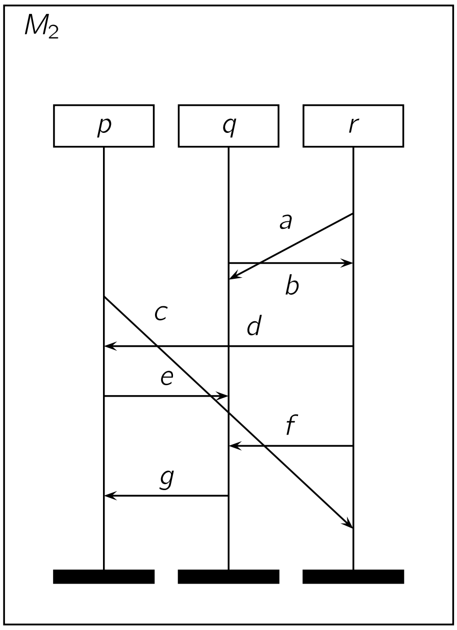
– Assignment 1 –

Exercise 1 **(2 points)**

Two diagrams are given:



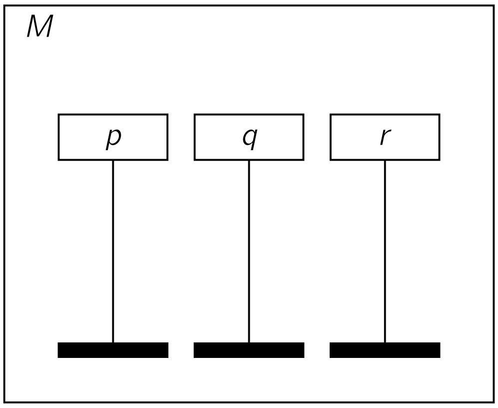


Questions:

1. Prove or disprove that M_1 is an MSC.
2. Does M_2 have a race? Justify your answer.

Exercise 2 **(3 points)**

An incomplete MSC M, which is supposed to have *exactly* 6 *events*, is shown as follows:



Questions:

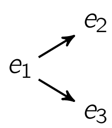
1. please complete M, such that it has the minimum number of linearizations.
2. please complete M, such that it has the maximum number of linearizations.
3. Determine all the linearizations in both MSCs.

Exercise 3 **(2 points)**

Consider a partial order $(E, \preceq)$, whose Hasse diagram is a *complete binary tree* of some depth, say k.

Question:

Give the recursive function (dependent on k) that gives the number of possible linearizations of $(E, \preceq)$.

- For example, $k = 1$: 

has 2 linearizations: $e_1\, e_2\, e_3$ and $e_1\, e_3\, e_2$.

Exercise 4 **(3 points)**

Prove or disprove that an MSC $M = (\mathcal{P}, E, \mathcal{C}, l, m, \preceq)$ has the *FIFO property* iff
for all $e, e' \in E$, $a \in \mathcal{C}$, $p, q \in \mathcal{P}$:

$$e = !(p,q,a),\, e' = ?(q,p,a) \text{ implies } \left|{\downarrow}e \cap \Big(\bigcup_{c \in \mathcal{C}} E_{!(p,q,c)}\Big)\right| = \left|{\downarrow}e' \cap \Big(\bigcup_{c \in \mathcal{C}} E_{?(q,p,c)}\Big)\right| ,$$

where ${\downarrow}e := \{e'' \mid e'' \preceq e\}$ and $E_b := \{e \mid l(e) = b\}$.