$$e_2^3 \not\longrightarrow e_1^3$$

P_1 — e_1^1 — e_1^2 — e_1^3

P_2 — e_2^1 — e_2^2 — e_2^3 — e_2^4

P_3 — e_3^1 — e_3^2 — e_3^3

$$e_2^1 \parallel e_3^1 \qquad e_3^1 \parallel e_1^3$$

time →

$t = 0$

$$e_i^x \longrightarrow e_j^y$$
$$P_i \qquad\qquad P_j$$

$\boxed{n = 3} \rightarrow P_1, P_2, P_3$

a) e_i^x occurs before e_j^y on the same process
ie, $\underline{i = j}$

$$\boxed{e_i^x} \longrightarrow \boxed{e_i^y}$$

b) e_1^2 (send)

$\searrow$

e_2^2 (receive)
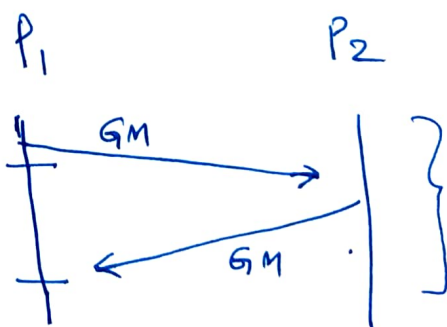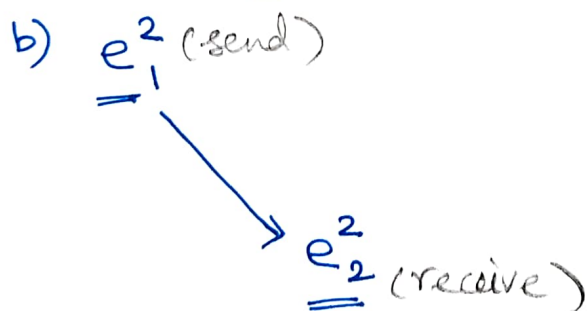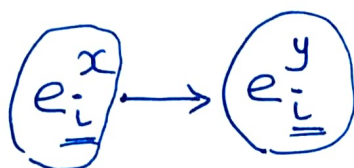
"Happens Before"

c) $e_1^2 \longrightarrow e_3^3$

$\boxed{e_1^2} \longrightarrow e_2^2$ (Send/receives)

$e_2^2 \longrightarrow e_2^3$ (on same P_2)

$e_2^3 \longrightarrow \boxed{e_3^3}$ (Send/Receive)

$P_1 \qquad\qquad P_2$

GM →

← GM

$P \qquad \boxed{ATM} \qquad \boxed{BANK}$

5000

R S

S R

S

R S

$\{X$

incoherencies
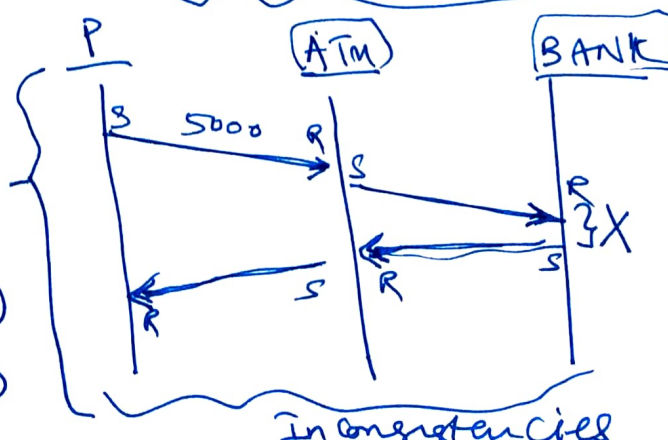
$$e_i^x \longrightarrow e_j^y$$

e_i^x happened before $e_j^y \Rightarrow \boxed{e_i^x}$ causally affects e_j^y

$$e_2^{③} \longrightarrow e_2^{④} \quad @ \quad P_2$$

$$\boxed{3} \longrightarrow \boxed{4}$$

$$\boxed{e_2^{\boxed{3}}} \not\rightarrow \boxed{e_i^{\boxed{3}}}$$

local
send   local