



T1 and T2 – totally ordered messages.

F1 and F2 – FIFO related questions.

C1 and C3 – Causally related messages.

Causal-ordering implies FIFO.

Causal ordering does not imply total ordering.

Thus, Causal-ordering and FIFO together does not imply total-ordering.

3. (a)

$$X[1] = [(1/3)(2/3)] [X]$$

$$Y[1] = [(2/3)(1/3)] [Y]$$

Thus on solving we get

$$X[1] = (X/3) + (2Y/3)$$

$$Y[1] = (2X/3) + (Y/3)$$

Since the input is 1 and 2, we have  $X = 1$  and  $Y = 2$

$$X[1] = [5/3]$$

$$Y[1] = [4/3]$$

3. (b)

$$[a] = [(1/6) (1/3) (1/3)] [a]$$

$$[b] = [(1/3) (1/6) (1/3)] [b]$$

$$[c] = [(1/3) (1/3) (1/6)] [c]$$