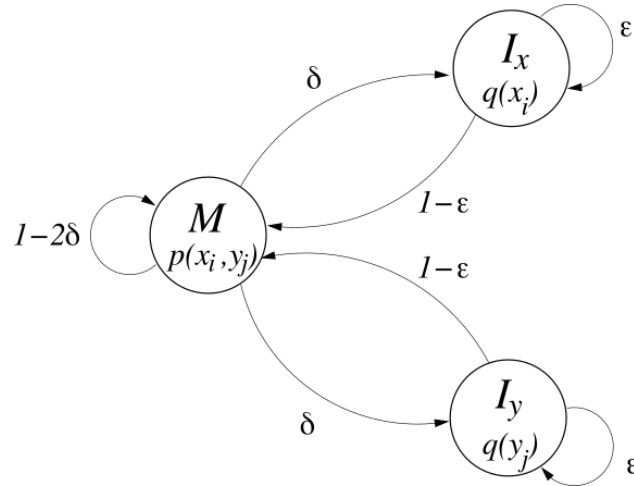


## Exercise sheet 4: Pair-HMM

### Exercise 1

You are given the basic pair-HMM for sequence alignment between two sequences:



Let  $\delta = 0.02$  and  $\epsilon = 0.79$ . The initial probability distribution of the states is given by  $\pi(M) = 0.6$ ,  $\pi(I_x) = 0.2$  and  $\pi(I_y) = 0.2$ . Furthermore, let all  $p(x_i, y_j)$  and  $q(x_i)$  (and  $q(y_j)$ ) be given in matrix  $p$  and vector  $q$ , respectively:

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