Q4 (2016):-

2. $\log p(X, C \mid \mu, \pi) = \sum_{i=1}^{N} \log p(x_i, c_i \mid \mu, \pi)$

$$= \sum_{i=1}^{N} \Big[\delta(c_i = H) \Big[\log \mu + \delta(x_i = HH) \log(\pi^2) + \delta(x_i = HT) \log(\pi(1-\pi)) + \delta(x_i = TH) \log((1-\pi)\pi) + \delta(x_i = TT) \log((1-\pi)^2) \Big] + \delta(c_i = T) \Big[\log(1-\mu) + \delta(x_i = HH) \log \pi + \delta(x_i = TT) \log(1-\pi) + \delta(x_i = HT) \log 0 + \delta(x_i = TH) \log 0 \Big] \Big]$$

$\leftarrow$ (optional)

$F(q, \mu, \pi) \rightarrow$ (replace $\delta(c_i = H)$ with q_i & $\delta(c_i = T)$ with $(1-q_i)$ above.)