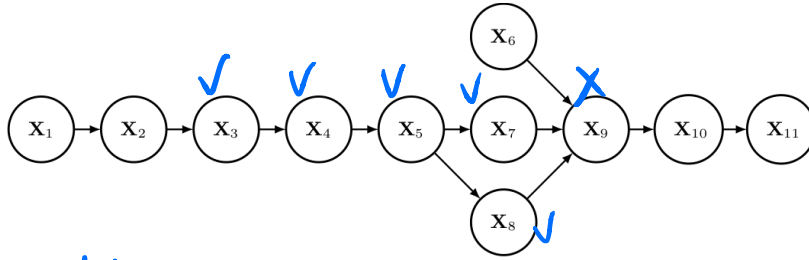


Question 1

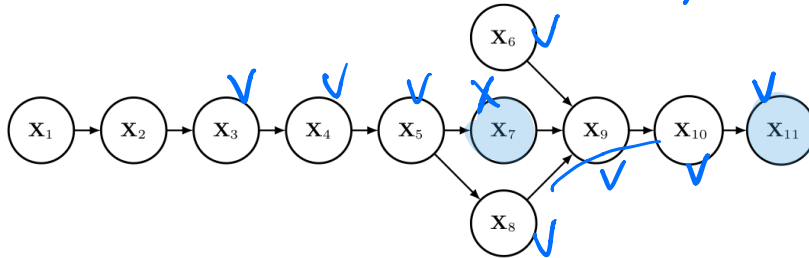
Wang Zijia 1002885

①



X_3 and X_6 are independent of each other. //

②



X_3 and X_6 are dependent of each other. //

Question 2

$$P(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}) \\ = P(X_1) P(X_2|X_1) P(X_3|X_2) P(X_4|X_3) P(X_5|X_4) P(X_6) P(X_7|X_5) P(X_8|X_5) P(X_9|X_6, X_7, X_8) \\ P(X_{10}|X_9) P(X_{11}|X_{10})$$

① no. of free parameters = $(2-1) + 2(2-1) + 2(2-1) + 2(2-1) + 2(2-1) + (2-1) + 2(2-1) + 2(2-1) + 2 \times 2 \times 2 \times (2-1) + 2(2-1) + 2(2-1)$
 $= 26 //$

② no. of parameters = $(5-1) + 5(5-1) + 5(3-1) + 3(5-1) + 5(5-1) + (5-1) + 5(5-1) + 5(5-1) + 5 \times 5 \times 5 \times (3-1) + 3(5-1) + 5(5-1) = 392 //$

Question 3

① $P(X_3=1|X_4=1) = \frac{P(X_3=1, X_4=1)}{P(X_4=1)} = \frac{P(X_3=1, X_4=1)}{P(X_3=1, X_4=1) + P(X_3=2, X_4=1)}$
 $= \frac{0.3 \times 0.1}{0.3 \times 0.1 + 0.7 \times 0.5} = 0.0789 //$

② $P(X_5=2|X_3=2, X_{11}=2, X_1=2) = \frac{P(X_5=2, X_3=2, X_{11}=2, X_1=2)}{P(X_3=2, X_{11}=2, X_1=2)}$
 $= \frac{P(X_3=2, X_5=2)}{P(X_3=2)} = \frac{0.7 \times (0.5 \times 0.5 + 0.5 \times 0.4)}{0.7} = 0.45 //$