NO.

3.1 (1) $P_{X,Y}(x,y)$ を求める

$P_{XY}(x,y) = P_{Y|X}(y|x) \cdot P_X(x)$

$x=0, y=0$ $P_{X,Y}(x,y) = 0.8 \times 0.7 = 0.56$

$x=0, y=1$ $P_{X,Y}(x,y) = 0.2 \times 0.7 = 0.14$

$x=1, y=0$ $P_{X,Y}(x,y) = 0.4 \times 0.3 = 0.12$

$x=1, y=1$ $P_{X,Y}(x,y) = 0.6 \times 0.3 = 0.18$

$P_{XYZ}(x,y,z) = P_{Z|XY}(z|x,y) \cdot P_{XY}(x,y)$ を求める

$x=0$	$y=0$	$z=0$	$P_{XYZ}(x,y,z) = 0.9 \times 0.56 = 0.504$
$x=0$	$y=0$	$z=1$	$P_{XYZ}(x,y,z) = 0.1 \times 0.56 = 0.056$
$x=0$	$y=1$	$z=0$	$P_{XYZ}(x,y,z) = 0.5 \times 0.14 = 0.070$
$x=0$	$y=1$	$z=1$	$P_{XYZ}(x,y,z) = 0.5 \times 0.14 = 0.070$
$x=1$	$y=0$	$z=0$	$P_{XYZ}(x,y,z) = 0.8 \times 0.12 = 0.096$
$x=1$	$y=0$	$z=1$	$P_{XYZ}(x,y,z) = 0.2 \times 0.12 = 0.024$
$x=1$	$y=1$	$z=0$	$P_{XYZ}(x,y,z) = 0.3 \times 0.18 = 0.054$
$x=1$	$y=1$	$z=1$	$P_{XYZ}(x,y,z) = 0.7 \times 0.18 = 0.126$

x	y	z	$P_{XYZ}(x,y,z)$
0	0	0	0.504
0	0	1	0.056
0	1	0	0.070
0	1	1	0.070
1	0	0	0.096
1	0	1	0.024
1	1	0	0.054
1	1	1	0.126

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NO.

(2) $P_{X|Z}(x|z) = \dfrac{P_{XZ}(x,y)}{P_Z(z)}$

$P_{XZ}(0,0) = P_{XYZ}(0,0,0) + P_{XYZ}(0,1,0) = 0.564 + 0.070 = 0.374$

$P_{XZ}(0,1) = P_{XYZ}(0,0,1) + P_{XYZ}(0,1,1) = 0.056 + 0.070 = 0.126$

$P_{XZ}(1,0) = P_{XYZ}(1,0,0) + P_{XYZ}(1,1,0) = 0.096 + 0.054 = 0.150$

$P_{XZ}(1,1) = P_{XYZ}(1,0,1) + P_{XYZ}(1,1,1) = 0.024 + 0.126 = 0.150$

$P_Z(0) = P_{XZ}(0,0) + P_{XZ}(1,0) = 0.574 + 0.150 = 0.724$

$P_Z(1) = P_{XZ}(0,1) + P_{XZ}(1,1) = 0.126 + 0.150 = 0.276$

$P_{X|Z}(0|0) = \dfrac{0.574}{0.724} = 0.793$ $P_{X|Z}(0|1) = \dfrac{0.126}{0.276} = 0.457$

$P_{X|Z}(1|0) = \dfrac{0.150}{0.724} = 0.207$ $P_{X|Z}(1|1) = \dfrac{0.150}{0.276} = 0.543$

X	Z	$P_{X\|Z}(x\|z)$
0	0	0.793
0	1	0.457
1	0	0.207
1	1	0.543

3

NO.

DATE

3.2 (a) $P = \begin{pmatrix} P_{00} & P_{01} & P_{02} & P_{03} \\ P_{10} & P_{11} & P_{12} & P_{13} \\ P_{20} & P_{21} & P_{22} & P_{23} \\ P_{30} & P_{31} & P_{32} & P_{33} \end{pmatrix} = \begin{pmatrix} 0.9 & 0.1 & 0 & 0 \\ 0 & 0 & 0.5 & 0.5 \\ 0.4 & 0.6 & 0 & 0 \\ 0 & 0 & 0.7 & 0.3 \end{pmatrix}$

$\underline{w} = (w_0\ w_1\ w_2\ w_2)$

$(w_0\ w_1\ w_2\ w_3) = (w_0\ w_1\ w_2\ w_3) \begin{pmatrix} 0.9 & 0.1 & 0 & 0 \\ 0 & 0 & 0.5 & 0.5 \\ 0.4 & 0.6 & 0 & 0 \\ 0 & 0 & 0.7 & 0.3 \end{pmatrix}$

$$\begin{cases} w_0 = 0.9w_0 + 0.4w_2 & \cdots ① \\ w_1 = 0.1w_0 + 0.6w_2 & \cdots ② \\ w_2 = 0.5w_1 + 0.7w_3 & \cdots ③ \\ w_3 = 0.5w_1 + 0.3w_3 & \cdots ④ \\ w_0 + w_1 + w_2 + w_3 = 1 & \cdots ⑤ \end{cases}$$

①より $w_0 = 4w_2 \cdots ⑥$

④より $w_3 = \frac{5}{7}w_1 \cdots ⑦$

③より $w_2 = 0.5w_1 + 0.7 \times \frac{5}{7}w_1$

$= w_1 \cdots ⑧$

$w_0 = 4w_1 \cdots ⑨$

⑥⑦⑧⑨ を ③ に代入

$4w_1 + w_1 + w_1 + \frac{3}{7}w_1 = 1$

$\frac{47}{7}w_1 = 1$

$w_1 = \frac{1}{47}$

$w_2 = w_1$ より

$w_2 = \frac{7}{47}$

$w_0 = \frac{28}{47}\ w_1 = \frac{7}{47}\ w_2 = \frac{7}{47}\ w_3 = \frac{5}{47}$

(b) $P_{X(0)} = 0.9w_0 + 0.5w_1 + 0.4w_2 + 0.3w_3$

$= 0.9 \times \frac{28}{47} + 0.5 \times \frac{7}{47} + 0.4 \times \frac{7}{47} + 0.3 \times \frac{5}{47}$

$= \frac{252}{470} + \frac{35}{470} + \frac{28}{470} + \frac{15}{470}$

$= \frac{330}{470} = \frac{33}{47}$

$P_{X(0)} = \frac{33}{47}$