2] $E_1 \rightarrow$ diagnosed correctly
$E_2 \rightarrow$ not diagnosed correctly
$B \rightarrow$ death

$P(E_1) = 0.6 \qquad P(E_2) = 0.4$

$P(B|E_1) = 0.4 \qquad P(B|E_2) = 0.7$

$$P(E_1|B) = \frac{P(E_1)P(B|E_1)}{P(E_1)P(B|E_1) + P(E_2)P(B|E_2)}$$

$$= \frac{0.6 \times 0.4}{0.6 \times 0.4 + 0.4 \times 0.7} = \frac{0.24}{0.24 + 0.28} = \boxed{\frac{6}{13}}$$

3] $P(A) = 4/9 \qquad P(B) = 2/9 \qquad P(C) = 3/9 = 1/3$

$X \rightarrow$ bonus scheme introduced

$P(X|A) = 0.3 \qquad P(X|B) = 0.7 \qquad P(X|C) = 0.8$

$$P(A|X) = \frac{P(A)P(X|A)}{P(A)P(X|A) + P(B)P(X|B) + P(C)P(X|C)}$$

$$= \frac{4/9 \times \frac{3}{10}}{4/9 \times 3/10 + 2/9 \times \frac{7}{10} + 1/3 \times 8/10} = \boxed{0.23}$$

4]

A → urn 1 B → urn 2 C → urn 3

W → white

$P(A) = P(B) = P(C) = \frac{1}{3}$

$P(W|A) = \frac{2}{5}$ $P(W|B) = \frac{4}{5}$ $P(W|C) = \frac{3}{7}$

$$P(A|W) = \frac{P(A)P(W|A)}{P(A)P(W|A) + P(B)P(W|B) + P(C)P(W|C)}$$

$$= \frac{\frac{1}{3} \times \frac{2}{5}}{\frac{1}{3} \times \frac{2}{5} + \frac{1}{3} \times \frac{4}{5} + \frac{1}{3} \times \frac{3}{7}}$$

$$= \frac{0.4}{0.4 + 0.8 + 0.43} = \boxed{0.25}$$

1]

B_1 → Box 1 B_2 → Box 2

D_1 → first chosen bulb defective

D_2 → second chosen bulb defective

X → both bulbs defective.

$P(B_1) = P(B_2) = \frac{1}{2}$

$P(D_1 | B_1) = \frac{1}{10}$ $\quad P(D_2|B_1) = \frac{11}{111}$

$P(D_1 | B_2) = \frac{1}{20}$ $\quad P(D_2|B_2) = \frac{99}{1999}$

$P(X | B_1) = \frac{1}{10} \times \frac{11}{111}$ $\quad P(X|B_2) = \frac{1}{20} \times \frac{99}{1999}$

$P(X) = P(B_1) P(X|B_1) + P(B_2) P(X|B_2)$

$= \frac{1}{2} \times \frac{1}{10} \times \frac{11}{111} + \frac{1}{2} \times \frac{1}{20} \times \frac{99}{1999}$

$P(X) = \boxed{0.00619}$

5] $X \rightarrow$ design is faulty
$Y \rightarrow$ design is not faulty
$A \rightarrow$ building collapse

$P(X) = \frac{1}{10}$ $\quad P(Y) = \frac{9}{10}$

$P(A|X) = \frac{95}{100}$ $\quad P(A|Y) = \frac{45}{100}$

$$P(X|A) = \frac{P(A|X) P(X)}{P(A|X)P(X) + P(A|Y) P(Y)}$$

Teacher's Sign.: _____

$$= \frac{\frac{19}{100} \times \frac{1}{10}}{19\frac{95}{100} \times \frac{1}{10} + \frac{459}{100} \times \frac{9}{10}} = \frac{19}{19 + 81}$$

$$= \boxed{0.19}$$

6] C → has cancer $P(C) = 0.07$

P → positive result

$P(P'|C) = 0.1$

$P(P|C') = 0.05$

$P(C') = 0.93$

$P(P'|C') = 0.95$

$$P(C|P') = \frac{P(P'|C)P(C)}{P(P'|C')P(C') + P(P'|C)P(C)}$$

$$= \frac{0.01 \times 0.07}{0.95 \times 0.93 + 0.1 \times 0.07}$$

$$= \boxed{0.0079}$$