1) A → manufactured by A
B → manufactured by B
C → manufactured by C
D → defective

$P(A) = \frac{1}{2}$ $P(B) = \frac{1}{4}$ $P(C) = \frac{1}{4}$

$P(D|A) = 0.02$
$P(D|B) = 0.02$
$P(D|C) = 0.04$

$P(D) = P(A)P(D|A) + P(B)P(D|B) + P(C)P(D|C)$
$= \frac{1}{2} \times 0.02 + \frac{1}{4} \times 0.02 + \frac{1}{4} \times 0.04$
$= \boxed{0.025}$

3) A_1 → selection of a male
A_2 → selection of a female

$P(A_1) = P(A_2) = 1/2$

A → selection of color-blind person

$P\left(\frac{A}{A_1}\right) = \frac{5}{100} = \frac{1}{20}$

$P\left(\frac{A}{A_2}\right) = \frac{25}{10000} = \frac{1}{400}$

Teacher's Sign.: _____

$$P\left(\frac{A_1}{A}\right) = \frac{P(A/A_1)\cdot P(A_1)}{P(A/A_1)\cdot P(A_1) + P(A/A_2)\cdot P(A_2)}$$

$$= \frac{1/20 \times 1/2}{\left(\frac{1}{20}\right)\left(\frac{1}{2}\right) + \left(\frac{1}{400}\right)\left(\frac{1}{2}\right)}$$

$$= \frac{1/40}{\frac{1}{40} + \frac{1}{20}}$$

$$= \frac{1}{21/20} = \boxed{\frac{20}{21}}$$

2)

$B_1 \rightarrow$ Bag 1 $\qquad B_2 \rightarrow$ Bag 2

$R \rightarrow$ choosing red ball

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

$$P(R|B_1) = 2/3 \qquad P(R|B_2) = 3/5$$

$$P(R) = P(B_1)\,P(R|B_1) + P(B_2)\,P(R|B_2)$$

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

$$= \boxed{0.63}$$

4) $B_1 \longrightarrow$ 5 red, 8 black

$B_2 \longrightarrow$ 7 red, 10 black

$P(R|B_1) = 5/13 \qquad P(R|B_2) = 7/17$

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

$P(R) = P(B_1)\,P(R|B_1) + P(B_2)\,P(R|B_2)$

$= \frac{1}{2} \times \frac{5}{13} + \frac{1}{2} \times \frac{7}{17}$

$= \boxed{0.4}$

6) $X \rightarrow$ studied for exam

$y \rightarrow$ did not study for exam

$A \rightarrow$ passed

$P(A|X) = 0.9 \qquad P(A|y) = 0.2$

$P(X) = 0.75 \qquad P(y) = 0.25$

$P(X|A) = ?$

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

$$= \frac{0.9 \times 0.75}{0.9 \times 0.75 + 0.2 \times 0.25} = \frac{0.45}{0.45 + 0.05} = \boxed{0.9}$$

5) A_1, A_2, A_3, A_4 → candidates

B_1, B_2, B_3, B_4 → project approval chance of each

B → project approval.

$$P(B) = P(A_1)P(B_1) + P(A_2)P(B_2) + P(A_3)P(B_3) + P(A_4)P(B_4)$$

$$= 0.3 \times 0.35 + 0.2 \times 0.85 + 0.4 \times 0.45 + 0.1 \times 0.15$$

$$= 0.105 + 0.17 + 0.18 + 0.015$$

$$= \boxed{0.47}$$