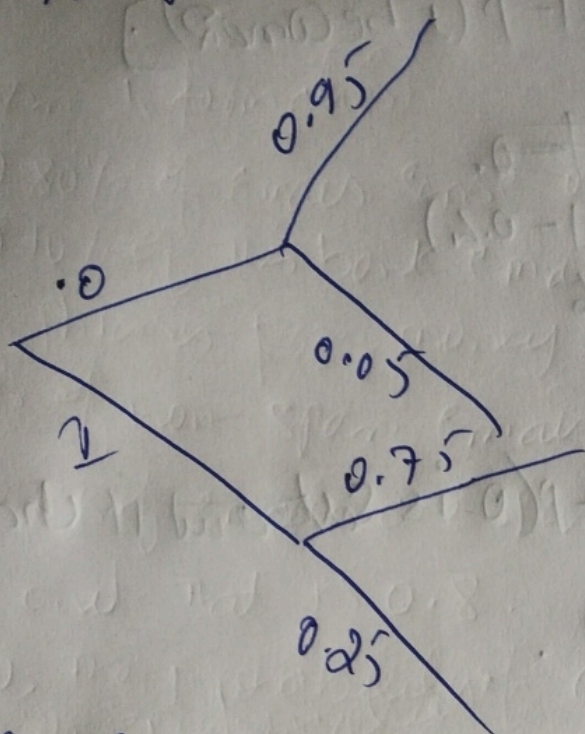1)

Given information:



From the above Tree diagram that

0 is sent Probability: 0.7
1 is Sent with Probability: 0.3
Due to noise 0 is changed with probability: 0.05
Due to noise 1 is change to 0 with probability = 0.25

A: The event that 1 is received
B: That event 1 is sent
I must find $P(B/A) =$

$$P(B/A) = \frac{P(A/B)\, P(B)}{P(A)}$$

$P(B)$ $= \frac{0.75 \times 0.3}{0.3} = 0.4$

(A)
$P(A|B) = P(1 \text{ is sent}) \times P(1 \text{ does not change})$

$P(1 \text{ does not change}) = [1 - P(1 \text{ becomes } 0)] \times$
$$[1 - P(1 \text{ becomes } 2)]$$

$= (1 - 0.7)(1 - 0.4)$
$= 0.3 \times 0.6$
$= 0.18$

$P(A) = P(1 \text{ sent and it } 1) + P(0 \text{ is sent and it changeto } 1)$

$P(A) = 0.18 + (0.7)(0.3).$

$P(A) = 0.39$

(B)
$P(B/A) = \dfrac{P(A/B)\, P(B)}{P(A)}$

$= \dfrac{0.18 \times 0.4}{0.39}$

$= 0.18$

(2) Given information:

(1) Judges = Choose random of seven Judges.
(2) 4 Judges Favour A
(3) 3 Judges Favour B.

Find $P(A)$

A : A will win the beauty contest.

total Judges : 7 Choose 3

$$= 7C_3$$

$$= \frac{7!}{3!(7-3)!}$$

$$= \frac{7!}{3! \, 4!}$$

$$= \frac{7\times6\times5\times\cancel{4}\times\cancel{3}\times\cancel{2}\times\cancel{1}}{(3\times2\times1)(\cancel{4}\times\cancel{3}\times\cancel{2}\times\cancel{1})}$$

$$= \frac{210}{6}$$

$$= 35$$

4 Favour of 'A' & 3 Favour of 'B'

$$P(A) = \frac{\cancel{35}}{\cancel{6}} \cdot \frac{4}{35} \qquad P(B) = \frac{3}{35}$$

$$= 0.11 \qquad\qquad\qquad = 0.08$$

The Probability That `A` will be declared as

$$winner = \frac{0.11}{0.11 + 0.08} = 0.57$$