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FA23-BEE-113 (B)
Probability Methods In Engineering
ASSIGNMENT 01

Q1:

Given Information:

Total Bulb = 10

Defective Bulb = 4 , So Accepted Bulb = 6

Two bulbs are selected random. without replacment. So,

$$^{10}C_2 = \frac{10!}{2!(10-2)!} = \frac{10\times 9}{2\times 1} = \frac{90}{2} = \boxed{45 = \text{overall total ways}}$$

So we have 45 different ways to select two bulbs at random without replacement.

(a) Probability of exactly one defacted bulb:

We have to select two bulbs and from given statment one of the bulb is defacted so the other is obviously accepted.

Total ways = Select 1 from defacted x Select other from accepted

$$= {}^4C_1 \times {}^6C_1 = 4\times 6 = \boxed{24 = \text{Total ways for [a]}}$$

So we have 24 way to select one of the defected bulb and other accepted.

$$\text{Prob[a]} = \frac{\text{Total ways for [a]}}{\text{over all total ways}} = \frac{24}{45} = \boxed{\frac{8}{15} = \text{Prob[a]}}$$

(b) Probability of exactly two defecteed bulbs

we have to select two bulb over all and both are defected.

Total ways = Select 2 from defacted

$$= {}^4C_2 = \frac{4\times 3}{2} = \boxed{6 = \text{Total ways for [b]}}$$

So we have 6 ways to select both defecteed bulb.

$$\text{Prob[b]} = \frac{\text{Total ways for [b]}}{\text{overall ways}} = \frac{6}{45} = \boxed{\frac{2}{15} = \text{Prob[b]}}$$

Q 2:

Given Information:

1: 5% components are defected : So 95% components are accepted

P[Defected] = P[D] = 0.05 : P[Not defected] = P[N.D] = 0.95

2: If component is defected there is 4% chance it was not rejected.

P[not rejected | defected] = 0.04

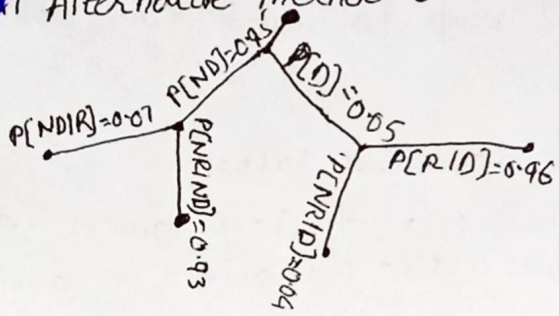
P[N.R | D] = 0.04 : So P[R|D] = 0.96

3: If component is not defected there is 7% chact it was rejected.

P[rejected | not defected] : So P[Not rejected | not defective]

P[R | N.D] = 0.07 : P[NR | ND] = 0.93

(i) Alternative method (TREE):



(a) Probability of component which are rejected:

P[R] = P[R.D] + P[R.ND]

= P[R|D]·P[D] + P[R|ND] P[ND]

= (0.96)(0.05) + (0.07)(0.95)

P[R] = 0.1145 , prob. of rejected is 0.1145 so P[Accept] · P[A] is: OR P[Not. Rejected] · P[NR]

P[NR] = 1 - P[R] = 1 - 0.1145 = 0.8855

(b) probability of rejected but not defected.

$$P[ND|R] = \frac{P[R|ND] \cdot P[ND]}{P[R]} = \frac{0.07 \times 0.95}{0.1145} = 0.581 \ (58\%)$$

(c) probability of not rejected is defected.

$$P[D|NR] = \frac{P[NR|D] \cdot P[D]}{P[NR]} = \frac{0.04 \times 0.05}{0.8855} = 0.002 \ (0.2\%)$$