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Q1 (a).

Total IC's = 9
Defective IC's = 3
No of tested IC's = 5

Outcomes where 2 are defective amongst the tested ones:

$$^{3}C_{2} = 3$$

Outcomes where 3 are correct amongst the tested ones:

$$^{6}C_{3} = 20$$

Probability of exactly 2 IC's being defective in the tested IC's =

$$\frac{^{3}C_{2} \times {^{6}C_{3}}}{^{9}C_{5}}$$

$$= \frac{3 \times 20}{126} = \boxed{0.47}$$

(Ans)

(Q1)(b)

$n = 6$
$k = 5$

No of outcomes $= n^k = 6^5 = 7776$

No of distinct ordered pairs $= {}^6P_5$

$= n(n-1)(n-2)(n-3)(n-4)$
$= 6 \times 5 \times 4 \times 3 \times 2 = 720$

Probability that all the outcomes are different $= \frac{720}{7776}$

$= \frac{5}{54}$

$= \boxed{0.092}$

(Ans)

(Q2) a.

Given that:

$$A = \{x \geq 1.5\}$$

$$B = \{x \leq 2.5\}$$

$$X = [1 \quad 3]$$

Find $P[A \cap B^c]$

$$B^c = \{x > 2.5\}$$

$$\Rightarrow A \cap B^c = [2.5 \quad 3]$$

$$\Rightarrow P[A \cap B^c] = \frac{\text{length}[2.5 \quad 3]}{\text{length}[1 \quad 3]}$$

$$P[A \cap B^c] = \frac{0.5}{2}$$

$$P[A \cap B^c] = \boxed{0.25}$$

(Ans)

(Q2)(b)

$$X = [-1 \quad 1]$$

$$A = \{ |X| \leq 0.2 \}$$

$$A = \{ -0.2 \leq X \leq 0.2 \}$$
$$B = \{ 0 \leq X \leq 0.4 \}$$

$$A^c = \{ -0.2 > X , X > 0.2 \}$$

$$A^c \cap B = [0.2 \quad 0.4]$$
$$A^c \cup B = [-1 \quad -0.2] \cup [0 \quad 0.4]$$

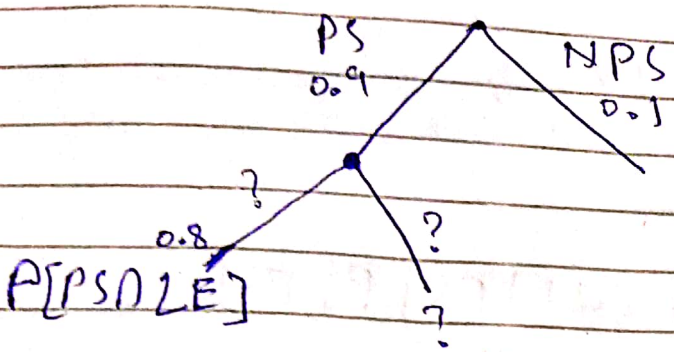
$$P[A^c \cap B] = \frac{0.4 - 0.2}{1-(-1)} = \frac{0.2}{2}$$
$$= P[A^c \cap B] = 0.1$$

$$P[A^c \cup B] = \frac{(-0.2-(-1)) + (0.4-0)}{1-(-1)} = \frac{1.2}{2}$$
$$P[A^c \cup B] = \boxed{0.6}$$ (Ans)

((Q3)(a))

$PS = 90\%$

$NPS = 10\%$



$P[PS] = 0.9$

$P[PS \cap LE] = 0.8$

$P[LE \mid PS] = ?$

Note: LE = Learned Eng
NLE = Not Learned Eng

$P[NLE \mid PS] = ?$

$P[PS \cap NLE] = ?$

$$P[LE \mid PS] = \frac{P[PS \cap LE]}{P[PS]} = \frac{0.8}{0.9} = 0.888$$

$P[NLE \mid PS] = ?$

we use Axioms rule

$P[A] + P[B] = 1$

$P[A] = 1 - P[B]$

$P[NLE|PS] = 1 - P[ES|PS]$

$P[NLE|PS] = 1 - P[ES|PS]$

$P[NLE|PS] = 1 - 0.888$

$P[NLE|PS] = 0.112$

$P[PS \cap NLE] = ?$

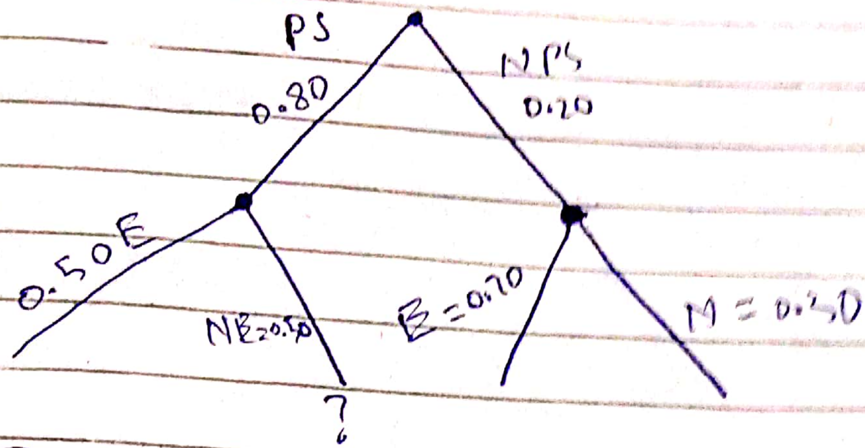
$P[PS \cap NLE] = P[NLE|PS]\, P[PS]$

$= 0.112 \times 0.9$

$P[PS \cap NLE] = \boxed{0.1008}$ (Ans)

Scanned with CamScanner

(Q3) (b).



$P[PS] = 0.80$

$P[NP] = 0.20$

$P[E|PS] = 0.50$

$P[NE|PS] = 0.50$

$P[E|NP] = 0.70$

$P[NE|NP] = 0.30$

$$P[PS|NE] = \frac{P[NE|PS]\,P[PS]}{P[NE]} = \frac{0.50 \times 0.80}{0.46}$$

$$= 0.86$$

$$P[NE] = P[NE|PS]\,P[PS] + P[NE|NP]\,P[NP]$$

$$= 0.50 \times 0.80 + 0.30 \times 0.20$$

$$= 0.40 + 0.06$$

$$= \boxed{0.46}$$

(Ans)

(Q 4(a))

$n = 6$

$P[5 \text{ and } 6] = 1/3$

$k = 4$

$$P_6(4) = {}^6C_4 \left(\tfrac{1}{3}\right)^4 \left(1 - \tfrac{1}{3}\right)^2$$

$$= \frac{6!}{4!\,(6-4)!} \left(\frac{1}{81}\right) (0.667)^2$$

$$= \frac{720}{24 \times 2} \left(\frac{1}{81}\right) (0.445)$$

$$= \frac{720}{3888} (0.445)$$

$$= \boxed{0.0824}$$

(Ans)

(Q4)(b)

$$P[A_i] = \frac{\text{length of sub interval}}{\text{length of full interval}}$$

$$P[A_1] = P[A_2] = \frac{0-(-1)}{2-(-1)} = \frac{1}{3}$$

$$P[A_3] = \frac{2-0}{2-(-1)} = \frac{2}{3}$$

The Required Probability:

$$P = \left(\frac{1}{3}\right)^2 \times \frac{2}{3}$$

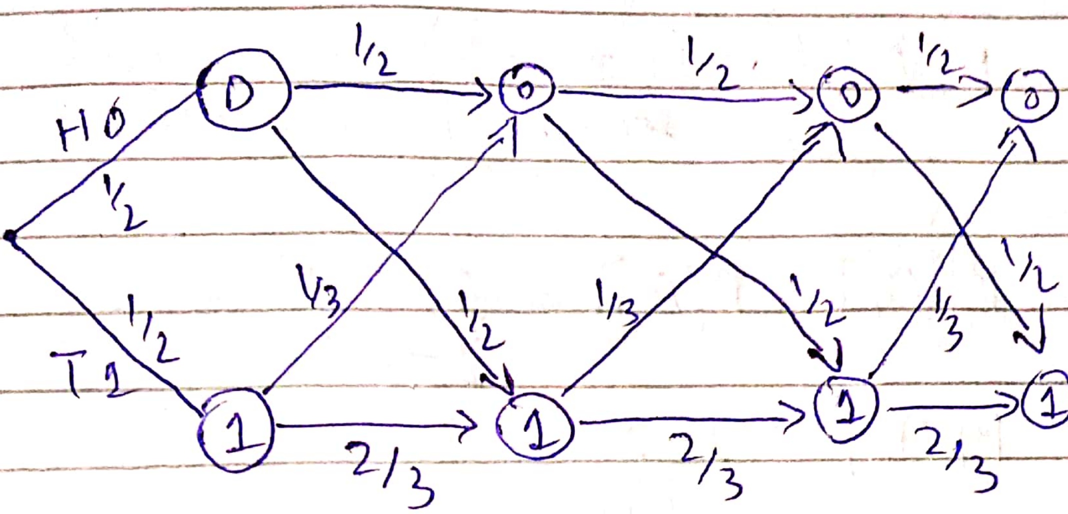
$$P = \frac{1}{9} \times \frac{2}{3}$$

$$P = \frac{2}{27}$$

$$\boxed{P = 0.074}$$

Ans

Q5)



$$P[1100] = P[1]P[1|1]P[0|1]P[0|0]$$

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

$$P[1100] = \frac{2}{36}$$

$$P[1100] = \boxed{0.055}$$ (Ans).