Assignment 6 Solution

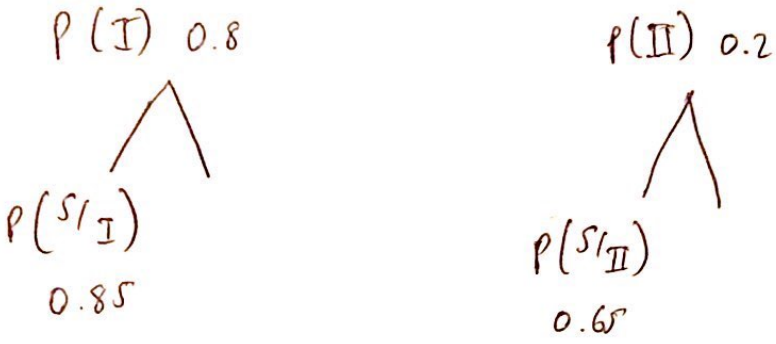
Probability and statitics (National University of Computer and Emerging Sciences)

Assignment 6
Solution

Marks Distribution :

Q1 :	5
Q2 :	5
Q3 :	8
Q4 :	6
Q5 :	12
Q6 :	5
Q7 :	10
Q8 :	9
Presentation :	10
Total :	70

(Q1)



$$P(S) = P(I \cap S) + P(II \cap S)$$
$$P(S) = P(I).P(S/I) + P(II).P(S/II)$$
$$P(S) = (0.8)(0.85) + (0.2)(0.65)$$
$$= 0.81$$

$$P(II/S) = \frac{P(II \cap S)}{P(S)} = \frac{0.65}{0.81} = 0.802$$

(Q2) i) $$P(X=4) = \frac{{}^{6}C_4 \times {}^{48}C_2}{{}^{54}C_6} = 0.000655$$

ii) $$P(X=0,1) = \left(\frac{{}^{6}C_0 \times {}^{48}C_6}{{}^{54}C_6}\right) + \left(\frac{{}^{6}C_1 \times {}^{48}C_5}{{}^{54}C_6}\right)$$

$$= 0.873$$

(Q3) a) $$P\left(\frac{P_r}{B}\right) = \frac{P(P_r \cap B)}{P(B)} = \frac{36/450}{116/450} = 0.310$$

b) $$P\left(\frac{P_r}{G}\right) = \frac{P(P_r \cap G)}{P(G)} = \frac{14/450}{334/450} = 0.042$$

c) $$P(P_r' \cap G) = P(P_r').P(G)$$

$$\frac{320}{450} = \frac{400}{450} \cdot \frac{334}{450}$$

$$0.71 \neq 0.66$$

$\therefore$ Not Independent

Q4

X	P(X)	
0	0.3	$(3C_2 \times {}^2C_0)/{}^5C_2$
1	0.6	$(3C_1 \times {}^2C_1)/{}^5C_2$
2	0.1	$(3C_0 \times {}^2C_2)/{}^5C_2$

Q5

X	f(z)	z = -6X	z.f(z)	$z^2 f(z)$
0	0.35	0	0	0
1	0.30	-6	-1.8	10.8
2	0.10	-12	-1.2	14.4
3	0.15	-18	-2.7	48.6
4	0.10	-24	-2.4	57.6
			E(z) = -8.1	$E(z^2) = 131.4$

i) Var (-6X)

$= 36\, V(X)$

$= 36\,(E(z^2) - (E(z))^2)$

$= 36\,(131.4 - (-8.1)^2)$

$= 2368.44$

ii)

X	z = 4X-3	f(z)	z.f(z)
0	-3	0.35	-1.05
1	1	0.30	0.30
2	5	0.10	0.5
3	9	0.15	1.35
4	13	0.10	1.3
			E(z) = 2.4

$\therefore E(4X-3) = 2.4$

iii) $E(x) = (1 \times 0.3) + (2 \times 0.1) + (3 \times 0.15) + (4 \times 0.1)$

$= 1.35$

$E(4x-3) \equiv 4(E(x)) - 3$

$2.4 \equiv 4(1.35) - 3$

$2.4 \equiv 2.4$

(Q6) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

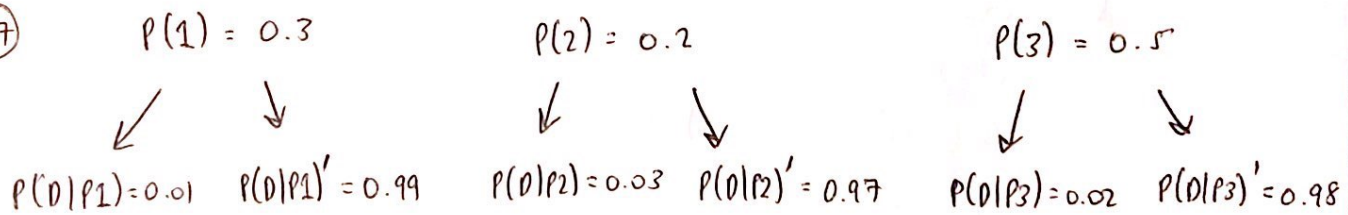
$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$= 1/3 + 3/4 - 11/12$

$= 1/6$

$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{1/6}{1/3} = 1/2$

(Q7)



$P(D) = P(1 \cap D) + P(2 \cap D) + P(3 \cap D)$

$= P(1) \cdot P(D|1) + P(2) \cdot P(D|2) + P(3) \cdot P(D|3)$

$= (0.3 \times 0.01) + (0.2 \times 0.03) + (0.5 \times 0.02)$

$= 0.019$

$P(1|D) = \frac{P(1 \cap D)}{P(D)} = \frac{P(1) \cdot P(D|1)}{P(D)} = \frac{0.3 \times 0.01}{0.019} = 0.158$

(Q8)

X	f(x)
80	0.2
200	0.5
220	0.3

i) $\text{Mean} = E(X) = (80 \times 0.2) + (200 \times 0.5) + (220 \times 0.3)$

$= 182$

$E^2(X) = (80^2 \times 0.2) + (200^2 \times 0.5) + (220^2 \times 0.3)$

$= 35,800$

$\text{Var}(X) = E^2(X) - (E(X))^2$

$= 35,800 - (182)^2$

$= 2676$

$C.O.V = \frac{\text{St. dev}}{\text{Mean}} \times 100$

$= \frac{\sqrt{2676}}{182} \times 100$

$= 28.42\%$

ii) $\text{Mean} = \frac{182 - 200}{20} = -0.9$

$\text{Variance} = \frac{\text{Var}(X)}{400} = \frac{2676}{400} = 6.69$

$C.O.V = \frac{\sqrt{6.69}}{-0.9} \times 100$

$= -287\%$