TEST 2 (ANSWER SCHEME)

Course: STATISTICS & PROBABILITY
Course Code: DUM2413
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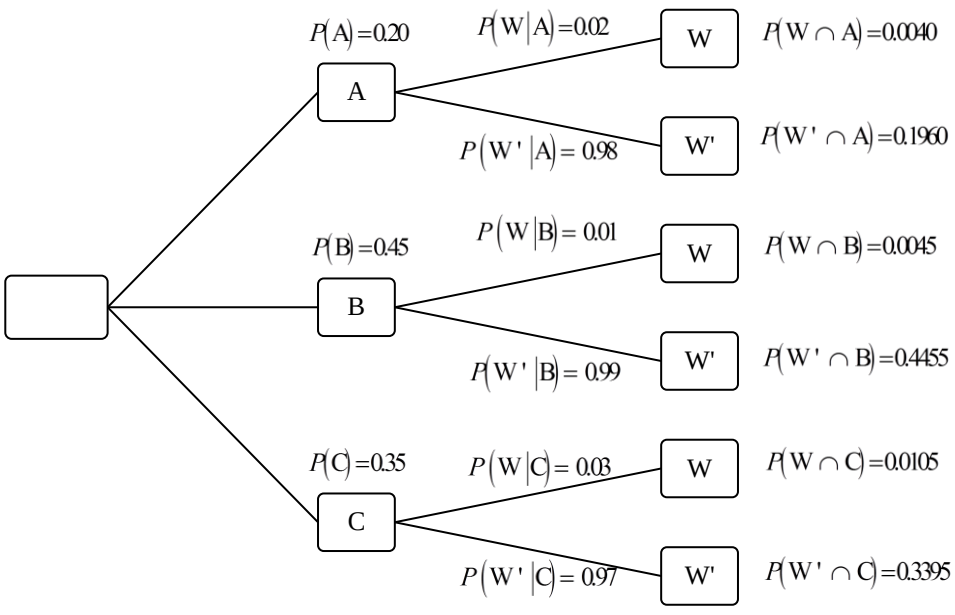
QUESTION 1	
Answer	**Remarks**

(i)

A: Hotel A; B: Hotel B; C: Hotel C; W: With Water Problem; W': Without Water Problem



(ii)

$P(\mathrm{W}') = P(\mathrm{W}' \cap \mathrm{A}) + P(\mathrm{W}' \cap \mathrm{B}) + P(\mathrm{W}' \cap \mathrm{C})$

$P(\mathrm{W}') = 0.1960 + 0.4455 + 0.3395$

$P(\mathrm{W}') = 0.9810$

(iii)

$$P(\mathrm{W}'|\mathrm{B}) = \frac{P(\mathrm{W}' \cap \mathrm{B})}{P(B)}$$

$$P(\mathrm{W}'|\mathrm{B}) = \frac{0.4455}{0.9810}$$

$P(\mathrm{W}'|\mathrm{B}) = 0.4541$

QUESTION 2

Answer	Remarks

(a)(i)

The number of three-digit can be formed:

$= 5 \times 4 \times 3$

$= 60$ ways

(a)(ii)

The number of three-digit can be formed:

$= 3 \times 5 \times 5$

$= 75$ ways

(b)(i)

The number of ways:

$= {}^{4}\mathrm{C}_1 \times {}^{4}\mathrm{C}_1 \times {}^{4}\mathrm{C}_1$

$= 64$ ways

(b)(ii)

The probability:

$$= \frac{{}^{4}\mathrm{C}_1 \times {}^{4}\mathrm{C}_1}{{}^{4}\mathrm{C}_1 \times {}^{4}\mathrm{C}_1 \times {}^{4}\mathrm{C}_1}$$

$= 0.2500$

(b)(iii)

The probability:

$$= \frac{{}^4C_1}{{}^4C_1 \times {}^4C_1 \times {}^4C_1}$$

$$= 0.0625$$

QUESTION 3

Answer	Remarks

(i)

$$\sum_{i=0}^{6} f(x_i) = 1$$

$$0.9 + \gamma\left(\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6}\right) = 1$$

$$\gamma = \frac{2}{49}$$

(ii)

$$E(X) = \sum_{i=0}^{6} x_i f(x_i)$$

$$E(X) = 0(0.9) + 1\left(\frac{2}{1(49)}\right) + 2\left(\frac{2}{2(49)}\right) + 3\left(\frac{2}{3(49)}\right) + 4\left(\frac{2}{4(49)}\right) + 5\left(\frac{2}{5(49)}\right) + 6\left(\frac{2}{6(49)}\right)$$

$$E(X) = \frac{12}{49}$$

QUESTION 4

Answer	Remarks

$$\lambda = 3.3$$

$$P(X \geq 2) = 1 - P(X < 2)$$

$$P(X \geq 2) = 1 - P(X \leq 1)$$

$$P(X \geq 2) = 0.8414$$

QUESTION 5	
Answer	**Remarks**
(i) $X \sim bin(x;12,0.45)$ **(ii)** **Mean:** $\mu = np = 12(0.45)$ $\mu = 5.4$ **Variance:** $\sigma^2 = np(1-p) = 12(0.45)(1-0.45)$ $\sigma^2 = 2.97$ **Standard Deviation:** $\sigma = \sqrt{np(1-p)} = \sqrt{12(0.45)(1-0.45)}$ $\sigma = 1.7234$ **(iii)** $P(X \le 3) = 0.1345$ **(iv)** $P(X \ge 6) = 1 - P(X < 6)$ $P(X \ge 6) = 1 - P(X \le 5)$ $P(X \ge 6) = 0.4731$ **(v)** $P(X = 7) = \binom{n}{k} p^k (1-p)^{n-k}$ $P(X = 7) = \binom{12}{7} (0.45)^7 (1-0.45)^{12-7}$ $P(X = 7) = 0.1489$	

QUESTION 6	
Answer	**Remarks**
$p = 0.0012; n = 1000$ $\lambda \simeq np = 1000(0.0012)$ $\lambda \simeq 1.2$ $P(X \le 2) \simeq 0.8795$	