QCM1 – Advanced Probability

Multiple Choice Questions – Chapter 1

Q1: A probability space is:

(a) A pair $(\Omega, \mathcal{F})$.
(b) A triplet $(\Omega, \mathcal{F}, P)$.
(c) A set of random variables.
(d) A probability density function.

Q2: A random variable is:

(a) A deterministic function from R to R.
(b) A function from the sample space Ω to R.
(c) An event in Ω.
(d) Always a normally distributed variable.

Q3: The expectation of a discrete random variable X is defined as:

(a) $E[X] = \sum_x x\, f(x)$.
(b) $E[X] = \int_{-\infty}^{\infty} f(x)dx$.
(c) $E[X] = \sqrt{\mathrm{Var}(X)}$.
(d) $E[X] = \sup(X)$.

Q4: The variance of a random variable X is:

(a) $V(X) = E[X] - (E[X])^2$.
(b) $V(X) = E[(X - E[X])^2]$.
(c) $V(X) = E[X^2]$.
(d) $V(X) = \sqrt{E[X]}$.

Q5: Two events A and B are independent if:

(a) $P(A \cup B) = P(A)P(B)$.

(b) $P(A \cap B) = P(A)P(B)$.

(c) $P(A|B) = P(A \cap B)$.

(d) $P(A|B) = \frac{1}{2}$.

Q6: Which of the following is a discrete distribution?

(a) Normal distribution.

(b) Uniform distribution on $[0, 1]$.

(c) Binomial distribution.

(d) Exponential distribution.

Q7: A random variable X follows the normal distribution $N(\mu, \sigma^2)$ if:

(a) Its probability density function is $\frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$.

(b) X takes integer values only.

(c) $E[X] = 0$ and $\text{Var}(X) = 1$.

(d) It is always symmetric around 1.

Q8: Which of the following properties of expectation is correct?

(a) $E[aX + b] = aE[X] + b$.

(b) $E[X + Y] = E[X] \cdot E[Y]$ for all random variables.

(c) $E[c] = 0$ for any constant c.

(d) $E[XY] = E[X] + E[Y]$ if X and Y are independent.

Q9: The k-th moment of a random variable X is defined as:

(a) $E[(X - E[X])^k]$.

(b) $E[X^k]$.

(c) $\text{Var}(X)^k$.

(d) $\sqrt[k]{E[X]}$.