…ent AREA to the LEFT of the Z score.

.06	.07	.08	.09
	.52790	.53188	.53586
	…749	.57142	.57535
		61026	.61409

Q. One: For the process $X(t) = 6\cos(t+\theta)$ where $\theta \sim U(0,\pi)$, we have $E(X^2(t)) =$

A) 0.5π B) π C) 2π D) 3π E) None

Q. Two: The variance of a mean-ergodic process $X(t)$ with no periodic component and $R_{XX}(\tau) = \pi + \pi^2 e^{-|\tau|}$ is equal to

A) π^2 B) π C) 2π D) 3π E) None

Q. Three: For a random process $X(t) = 3A\cos(t)$ where $A \sim U(0,\pi)$ we have $P_{XX} =$

A) $\frac{1}{12}$ B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $\frac{1}{6}$ E) None

Q. Four: For $X \sim Poisson(m)$ with $P(X=0) = \sqrt{\frac{1}{e}}$; then $P(X > \bar{X}) =$

A) $\sqrt{\frac{1}{e}}$ B) $\frac{1}{e}$ C) $1-\sqrt{\frac{1}{e}}$ D) $1-\frac{1}{e}$ E) None

Q. Five: Jointly wide-sense stationary orthogonal processes $X(t)$, $Y(t)$ with $R_{XY}(\tau) = 1 + \bar{X}\,\bar{Y}$, then $C_{XY}(t, t+\tau) =$

A) 1 B) 0 C) 2 D) 3 E) None

Q. Six: For jointly wide-sense stationary uncorrelated (indep) discrete time random processes $X(nT_S), Y(nT_S)$ such that $C_{XY}(nT_S, nT_S + kT_S) = 4 - \bar{X}\,\bar{Y}$. Then $R_{XY}(kT_S) + \bar{X}\,\bar{Y} =$ (4 + 4)

A) 2 B) 4 C) 6 D) 8 E) None

Q. Seven: If $Var(X) = 3$, and $Y = X - \bar{X}$, then the correlation of X and Y is

A) 1 B) 2 C) 3 D) 4 E) None

Q. Eight: The pdf of $Y = 4X + 1$; where $X \sim U(0,1)$, equals

A) 2 B) 0.25 C) 0.5 D) 1 E) None

Q. Nine: The variance of the process $X(t) = A$ where $A \sim U(-\pi,\pi)$ is equal to

A) $\frac{2\pi^3}{3}$ B) $\frac{\pi^3}{3}$ C) $\frac{\pi^2}{3}$ D) $\frac{2\pi^2}{3}$ E) None

Q. Ten: For $X \sim N(a,a)$ if $std(X) = E(X)$, then $a + std(X) =$

A) 1 B) 4 C) 6 D) 2 E) None

Question Seven: Let f be a continuous strictly increasing function on $\mathbb{R}$. Then we have $\int_{-\infty}^{\infty} f(x)(\delta(x+1)-\delta(x-1))\,dx$ is

$F(-1) - 1$

A) zero B) negative C) positive D) equal to one E) None

Question Eight: For the joint PDF $f(x,y) = 2\,x^{\,b}$ when $0 < x < 1$, $0 < y < 1$ and zero otherwise, the positive constant b equals

A) 2 B) 0.5 C) 0 D) 1 E) None

Question Nine: For the joint PDF $f(x,y) = 0.5$ when $0 < x < 1$, $0 < y < 2$ and zero otherwise, we have $P(0 < Y < 0.2) =$

A) 0.1 B) 0 C) 0.25 D) 0.5 E) None

Question Ten: A discrete random variable X with PDF

$P(X = x) = a(\ \delta(x) + \delta(x-1) + \delta(x+1) + \delta(x-2)\ )$; where $a > 0$ is a constant, then we have $a + P(X=0) + P(X=1) + P(X=-1) =$

A) 0 B) 1 C) 0.75 D) 0.5 E) None

Question Eleven (✓,X): For continuous random variables X, Y we always have $Cov(-X-1, -Y) \geq -\sigma_X\sigma_Y$ X

Question Twelve (✓,X): For continuous random variable X with CDF $F(x) = 1 - e^{-\sqrt{x}}$ when $x > 0$ and zero otherwise; then the PDF is $f(x) = e^{-\sqrt{x}}/\sqrt{x}$ X

Question Thirteen (✓,X) : If $x \in (-1,1)$; then $u(-x-1) + \delta(x-2) = 1$ ✓

Question Fourteen (✓,X) For some random variable X , if the CDF $F(x) = x^3, x \in (0,1)$, then $P(X \in (0, 0.1)) + P(X = 0.5) = 0.01$ X

Question Fifteen (✓,X): Given the CDF

$$F(x) = \begin{cases} 0 & x < 1 \\ 0.25 & 1 \leq x < 2 \\ 1 & 2 \leq x \end{cases}$$ ✓

We have $P(X = 2) = 3/4$

Question One: If $P(B) = 0.25$ and $P(A - B) = 0.25$ then we get $P(A|\Omega) - P(B)P(A|B) =$

A) 0.25 B) 0.5 C) 0 D) 0.2 E) None

Question Two: For some disjoint and independent events A, B with $P(A) = 0.1$ we have $P(B) =$

A) 1 B) 0.3 C) 0 D) 0.4 E) None

Question Three: Let X be a discrete random variable with $E(X) = \bar{X}$. If $P(X = \bar{X}) = 0.8$, then $P(X \neq \bar{X}) =$

$p(x) + p\bar{x} = 1$

A) 0 B) 0.8 C) 0.75 D) 0.2 E) None

Question Four: For some independent events A, B with $P(A)P(B) = 0.2$ then we have $P(\bar{A} \cup \bar{B}) = p(\overline{A \cap B})$

$1 - \cancel{0.04}$

$1 - 0.2$

A) 0.9 B) 0.8 C) 0.7 D) 0.6 E) None

Question Five: Let A, B be two events with equal probability and $P(\bar{A} \cap B) + P(\bar{B} \cap A) = 1.6$, then $P(A) =$

A) 0.2 B) 0.1 C) 0.8 D) 0.3 E) None

Question Six: Let X be a discrete random variable with $R_X = \{0, 1, -1\}$ then we have $E(X^2) + E(X^4) - 2E(X^6) =$

A) 0 B) 1 C) 2 D) -1 E) None

Q. Eleven: If $\alpha > 0$ be a number that satisfies $(-1)^{\alpha} = -1$. If we have $E(X^2(t)) = t^{\alpha} + \pi + \sin(t)$ then $P_{XX} =$

A) π B) 3π C) 2π D) 0 E) None

Q. Twelve: Which of the following is false?

A) The null hypothesis is the one to be tested

B) Null and alternative hypotheses cannot be both true at the same time

C) For $X \sim N(1,2)$ then $P(X > 2) = 0.5$

D) Type I error occurs when we reject H_0 when it is actually true

Q. Thirteen: Consider the joint pdf $f(x,y) = x$ when $0 < x < 2$, $0 < y < b$ and zero otherwise. Then $f_Y(y) =$

A) $0.5x$ B) x C) $2y$ D) 2 E) None

Q. Fourteen (✓, X): For any constant $x > 0$, we have $u(x) < \delta(x)$

Q. Fifteen (✓, X): A correlation coefficient 0.97 indicates a strong negative correlation

Q. Sixteen (✓, X): The process $X(t) = A\cos(wt)$, $A \sim U(1,2)$ is not first order stationary

Q. Seventeen (✓, X): The process $X(t) = \cos(wt)$, $w \sim U(1,2)$ is not first order stationary

Q. Eighteen (✓, X): For some independent random variables X, Y with $E(XY) = ?$, then we must have $\bar{X} = 1$ and $? = 0$

Q. Nineteen (✓, X): For $X \sim B(n,p)$ if $\frac{Var(X)}{E(X)} = 0.2$, then $p = 0.8$

Q. Twenty (✓, X): If $X \sim B(n, 0.5)$ and $E(X^2) = 5$, then $n = 5$