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西交利物浦大学

MTH102 Engineering Mathematics II

Sem 2, Year: 2017/18

Assignment 2 Week: 11

May 9, 2018

The assignment is due Wednesday May 16 at 5pm.
You will need to enter your answers on ICE. Beware that **on ICE the multiple choices will be presented in random order**. Therefore you need to choose the right answer from the list and not the right reference letter when entering your answers.
Do not submit hard copies, only the answers entered on ICE will be graded.
Late submissions will not be accepted.
The assignment comprises of 5 questions each worth 20 marks. The assignment is worth 5% of the course mark.

Questions

The first 3 questions refer to the same distribution

Two variables X and Y have joint pdf

$$f_{XY}(x,y) = \begin{cases} 3(x^2+y^2) & \text{if } 0 < x \leq 1,\ x < y \leq 1 \\ 0, & \text{elsewhere.} \end{cases}$$

Q.1 [20 marks]

The cumulative distribution function is

(a) $-x^4 + yx^3 + y^3x$
(b) $x^2y^3 + x^3y - x^4$
(c) $\frac{3}{2}(x^4y + x^3y^3)$
(d) $x^3y(1+y^2)$

Q.2 [20 marks]

The marginal pdfs $f_X(x)$ and $f_Y(y)$ are

(a) $f_X(x) = 3x^2 - 4x^3 + 1,\ f_Y(y) = 3y^2 + 1$
(b) $f_X(x) = 3x^2 + 1,\ f_Y(y) = 4y^3$
(c) $f_X(x) = 3x^2 - 4x^3 + 1,\ f_Y(y) = 4y^3$
(d) $f_X(x) = 3x^2 + 1, f_Y(y) = 3y^2 + 1$

Q.3 [20 marks]

The expected values $E(X)$ and $E(Y)$ are equal to

(a) $E(X) = \frac{1}{2},\ E(Y) = \frac{2}{3}$
(b) $E(X) = \frac{9}{20},\ E(Y) = \frac{2}{3}$
(c) $E(X) = \frac{9}{20},\ E(Y) = \frac{4}{5}$
(d) $E(X) = \frac{1}{2},\ E(Y) = \frac{4}{5}$

Q.4 [20 marks]

Two independent variables X and Y are distributed as normal with mean $\mu = 0$ and variance $\sigma^2 = 1$. Let $Z = \sqrt{X^2 + Y^2}$, the probability $P(Z \leq 1.5)$ is equal to

(a) 0.3935 mm

(b) 0.6753 mm

(c) 0.6065 mm

(d) 0.3247 mm

Q.5 [20 marks]

Mr Ken Seng produces thimbles. The width of women's fingers is distributed as a normal variable with mean $\mu = 5$mm and standard deviation $\sigma = 1.5mm$. What is the maximum diameter of thimbles to be sure that the probability that they don't fit a woman's finger is 0.15?

(a) 6.27

(b) 3.44

(c) 10.2

(d) 6.56