The Open University of Sri Lanka

B.Sc/B.Ed. DEGREE, CONTINUING EDUCATION PROGRAMME

Open Book Test 2017/2018

Level 04 Applied Mathematics

ADU4300– Statistical Distribution Theory

Duration: - One hour

Date: - 11-06-2018   Time: - 4.15 – 5.15

Non programmable calculators are permitted. Statistical tables are provided.

Answer all questions.

(1) This Question consists of 10 multiple choice questions. Underline the correct answer.

1. Suppose X is a continuous random variable with density function $f(x)$. Expected value of X is equal to

    1) $\int_{-\alpha}^{\alpha} f(x)dx$ 2) $\sum xf(x)dx$ 3) $\int_{-\alpha}^{\alpha} x f(x)dx$ 4) none of the above

2. Variance of a random variable X is equal to

    1) $E(X)$ 2) $E(X^2)$ 3) $E(X^2) - E(X)$ 4) $E(X^2) - [E(X)]^2$

3. Let X be a continuous random variable with density function $f(x)$. Suppose $g(x)$ is a function of X. Expected value of $g(x)$ is equal to

    1) $E(X)$ 2) $g(x).E(X)$ 3) $\int_{-\alpha}^{\alpha} g(x).f(x)dx$ 4) none of the above.

4. X is a random variable. $Var(3X + 4)$ is equal to

    1) $3Var(X)$ 2) $3Var(X) + 4$ 3) $9Var(X)$ 4) none of the above

X is a discrete random variable. Probability mass function of X is given bellow.

x	a	b	c
$P(X = x)$	p	q	r

Questions 5. to 7. are based on the above distribution. Underline the correct answer.

5. Underline the correct statement

    1) Always $p = q$ 2) Always $p + q = r$ 3) Always $p + q = 1 - r$

    4) Always $p + q < 1 - r$

6. $E(X)$ is equal to

   1) $p+q+r$ 2) $\dfrac{a+b+c}{3}$ 3) $ap+bq+cr$

   4) none of the above

7. $E(X+3)$ is equal to

   1) $p+q+r+3$ 2) $\dfrac{a+b+c}{3}+3$ 3) $(a+3)p+(b+3)q+(c+3)r$

   4) none of the above

Let X be a continuous variable with density function given below.

$$f(x) = \begin{cases} f_1(x); & 0 \le x \le 5 \\ f_2(x); & 5 < x < 7 \end{cases}$$

Questions 8. to 10. are based on the above distribution. Underline the correct answer.

8. Expected value of X is equal to

   1) $\displaystyle\int_0^7 [f_1(x)+f_2(x)]dx$ 2) $\displaystyle\int_0^7 xf(x)dx + \int_0^7 xf_2(x)dx$

   3) $\displaystyle\int_0^5 xf_1(x)dx + \int_5^7 xf_2(x)dx$ 4) none of the above

9. $\Pr(2 < X < 3)$ is equal to

   1) $\displaystyle\int_2^3 f_1(x)dx$ 2) $\displaystyle\int_2^3 [f_1(x)+f_2(x)]dx$ 3) $\displaystyle\int_2^3 f_2(x)dx$

   4) none of the above

10. $\Pr(2 < X < 7)$ is equal to

   1) $\displaystyle\int_2^7 [f_1(x)+f_2(x)]dx$ 2) $\displaystyle\int_2^7 f_1(x)dx$ 3) $\displaystyle\int_2^5 f_1(x)dx + \int_5^7 f_2(x)dx$

   4) $\displaystyle\int_2^7 f_2(x)dx$

(50 Marks)

2.

(2)

An inspector is looking for the non-conforming welds in a pipe line. The probability that any particular weld is defective is 0.01.

(a) Suppose that the inspector checked 20 welds. Calculate each of the following.

    (i) The probability of finding 3 non confirming welds out of checked 20 welds

    (ii) The probability of finding none of the none-confirming welds out of checked 20 welds

    (iii) Expected number of non-confirming welds out of checked 20 welds

(b) Suppose the inspector is determined to keep walking until he finds three defective welds. If the first weld is located at a distance of 10 m apart from the starting of the pipe line and the welds are located in 15m apart,

    (i) Find the probability that the inspector will have to walk 1km.

    (ii) Find the probability that the inspector will have to walk more than 1km.

(50 marks)