Assignment No.2 (Course STA 301)
Spring 2022 (Total Marks 20)
For word file:
03066793776

Deadline

Your Assignment must be uploaded/ submitted before or on

August 30 , 2022, Time 23:59

(STUDENTS ARE STRICTLY DIRECTED TO SUBMIT THEIR ASSIGNMENT BEFORE OR BY DUE DATE. NO ASSIGNMNENT AFTER DUE DATE WILL BE ACCEPTED VIA E.MAIL).

Rules for Marking

It should be clear that your Assignment will not get any credit IF:

- **The Assignment submitted, via email, *after due date.***
- **The submitted Assignment is not found as MS Word document file.**
- **There will be unnecessary, extra or irrelevant material.**
- **The Statistical notations/symbols are not well-written i.e., without using MathType software.**
- **The Assignment will be copied from handouts, internet or from any other student's file. Copied material (from handouts, any book or by any website) will be awarded ZERO MARKS. It is PLAGIARISM and an Academic Crime.**
- **The medium of the course is English. Assignment in Urdu or Roman languages will not be accepted.**
- **Assignment means Comprehensive yet precise accurate details about the given topic quoting different sources (books/articles/websites etc.). Do not rely only on handouts. You can take data/information from different authentic sources (like books, magazines, website etc.) BUT express/organize all the collected material in YOUR OWN WORDS. Only then you will get good marks.**

Objective(s) of this Assignment:

The assignment is being uploaded to build up the concepts " discrete distribution and continuous distribution".

Assignment # 2

Lectures(25-30)

Question 1: **Marks=10**

Let X be a continuous random variable whose probability density function is:

$$f(x)=\frac{x^3}{4}$$

For an interval 0<x<c. What is the value of constant c that makes f(x) a valid probability density function?

Solution:

We know that

$\int_{-\infty}^{\infty} f(x)dx = 1$ And here f(x) = $\frac{x^3}{4}$

Then

$$\int_0^c \frac{x^3}{4}\,dx = 1$$

$$\frac{1}{4}\int_0^c x^3\,dx = 1$$

$$\frac{1}{4}\left[\frac{x^4}{4}\right]_0^c = 1$$

$$\frac{1}{4}\left[\frac{c^4}{4}-\frac{0}{4}\right] = 1$$

$$\frac{1}{4}\left[\frac{c^4}{4}\right] = 1$$

$$\frac{c^4}{16} = 1$$

$$c^4 = 16$$

$$c^4 = 2^4$$

Because powers are equal so

$$c = 2$$

Question 2: **Marks=10**

From the following joint p.d of X and Y. Find E(X), Var (Y) and Cov(X, Y).

x	y	0	1	2	3	g(x)
0		0	0.25	0.05	0.05	0.35
1		0.03	0.10	0.10	0.15	0.38
2		0.07	0.10	0	0.10	0.27
h(y)		0.10	0.45	0.15	0.30	1

Solution:

$E(X) = \sum xig(xi)$

$E(X) = (0 \times 0.35) + (1 \times 0.38) + (2 \times 0.27)$

$E(X) = 0 + 0.38 + 0.54$

$E(X) = 0.92$

$E(Y) = \sum yjh(yj)$

$E(Y) = (0 \times 0.10) + (1 \times 0.45) + (2 \times 0.15) + (3 \times 0.30)$

$$E(Y) = 0 + 0.45 + 0.30 + 0.90$$

$$E(Y) = 1.65$$

$$E(Y^2) = \sum y^2 jh(yj)$$

$$E(Y^2) = [0 \times 2(0.10)] + [1 \times (0.45)] + [4 \times (0.15)] + [9 \times (0.30)]$$

$$E(Y^2) = 0 + 0.45 + 0.60 + 2.7$$

$$E(Y^2) = 3.75$$

$$Var(Y) = E(Y^2) - [E(Y)]^2$$

$$Var(Y) = 3.75 - (1.65)^2$$

$$Var(Y) = 1.0275$$

$$E(XY) = \sum_i \sum_j (xiyj)\, f(xi, yj)$$

$$E(XY) = (1 \times 0.10) + (2 \times 0.10) + (3 \times 0.15) + (2 \times 0.10) + (4 \times 0) + (6 \times 0.10)$$

$$E(XY) = 0.10 + 0.20 + 0.45 + 0.20 + 0 + 0.60$$

$$E(XY) = 1.55$$

$$Cov(XY) = E(XY) - E(X)E(Y)$$

$$Cov(XY) = 1.55 - (0.92)(1.65)$$

$$Cov(XY) = 1.55 - 1.51$$

$$Cov(XY) = 0.03$$