



Victoria University of Bangladesh

Assessment Topic:

Final Examination

Course Title: Statistical Decision Making

Course Code: STA-321

Submitted To:

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Ans: to the question no-1

★ Ans:- Sampling Distribution:- Sampling distribution of \bar{x} . The probability distribution of \bar{x} is called its sampling distribution. It lists the various values that \bar{x} can assume and the probability of each value of \bar{x} .

In general, the probability distribution of a sample statistic is called its sampling distribution.

★ Sampling Error & Non Sampling Error:- Sample will generally be different from the result obtained from the corresponding population. The difference between the value of a sample statistic obtained from a sample and the value of the corresponding population parameter obtained from the population is called the Sampling Error.

Sampling Error is the difference between the value of a sample statistic and the value of the

Corresponding population parameter. In the case of the mean, Sampling Error = $\bar{x} - \mu$

assuming that the sample is random and no nonsampling error has been made.

Non Sampling Error:- The error that occur for other reasons, such as error made during collection, recording and tabulation of data are called non-sampling error. These error occur because of human mistake, and not chance. There is not just one nonsampling error but there are many nonsampling error that may occur for different reasons.

The error that nonsampling can be attributed to many sources. e.g. inability to obtain information about all cases in the sample, definitional difficulties, differences in the interpretation of questions, inability or unwillingness on the part of the respondents to provide correct information, inability to recall information, etc.

Ans: to the question no-02

★ Ans:- Union of Events:- The union of two or more sets refers to the set with all the elements belonging to each set. An element is said to be in the union if ~~it~~ it lies to at least one of the sets.

The symbol \cup is popularly used for union and its association with the word "or". This is because $A \cup B$ is the set of all elements in A or B or even both.

In order to find out the union of two sets, we list the elements in A or B or both sets. This can be easily represented with the help of the Venn diagram. Here, the expression of the union of sets "A" and "B" can take place as two interlocking circles that are entirely shaded.

For a good understanding of union and intersection of events one must understand their expression in symbols. In symbols the definition of the union

of events can be expressed as follows—

$$A \cup B = \{x: x \in A \text{ or } x \in B\}$$

So, if we consider, if $A = \{1, 3, 5, 7\}$ and $B = \{1, 2, 4, 6\}$

Then $A \cup B$ would be $= \{1, 2, 3, 4, 5, 6, 7\}$

Here, the listing of element 1 does not take place twice in the union. Even though its appearance is in both "A" and "B" sets.

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P.T.O

Ans: to the question no-03

* Ans:- Random variable:- A Random variable is a variable whose value is unknown on a function that assigns values to each of an experiment's outcomes. Random variables are often designated by letters and can be classified as discrete, which are variables that have specific values or continuous, which are variables that can have any value within a continuous range. Random variables are often used in econometric or regression analysis to determine statistical relationships among one another.

Key takeaways

1. A Random variable is a variable whose value is unknown on function that assigns values to each of an experiment's outcomes.

2. A Random variable can be either discrete or continuous.

3. Risk analysts use random variables to estimate the probability of an adverse event occurring.

P.T.O

★ Different types of Random variable:— There are two different types of random variables, such as—

I Discrete Random variable.

II Continuous Random variable.

Discrete Random variable:— A discrete random variable can take only a finite number of distinct values such as $0, 1, 2, 3, 4, \dots$ and so on. The probability distribution of a random variable has a list of probability compared with each of its possible values known as probability mass function.

In an analysis let a person be chosen at random and the person's height is demonstrated by a random variable.

Continuous Random variable:— A numerically valued variable is said to be continuous if, in any unit of measurement whenever it can take on the values a and b . If the random variable X can assume an infinite and uncountable set of values, it is said to be a continuous random variable. When X takes any value in a given interval (a, b) , it is said to be a continuous random variable in that interval. Formally— a continuous random variable is such whose cumulative distribution function is constant throughout.

Ans: to the question no-04

* Ans:- Normal Approximation to the Binomial Distribution: The normal approximation to the binomial distribution is when you use a continuous distribution to approximate a discrete distribution. According to the Central Limit Theorem, the sampling distribution of the sample means becomes approximately normal if the sample size is large enough. There are four types of the normal approximation to the binomial distribution such as -

- ① The binomial distribution is applied to a discrete random variable.
- ② Each repetition, called a trial of a binomial experiment results in one of two possible out-comes, either a success or a failure.
- ③ The probabilities of the two possible out come remain the same for each repetition of the experiment.
- ④ The trials are independent.

The binomial formula, which gives the probability of x successes in n trials, is -

$$P(x) = {}^n C_x p^x q^{n-x}$$

The use of the binomial formula becomes very tedious when n is large. In such cases, the normal distribution can be used to approximate the binomial probability. Note that for ~~the~~ a binomial problem, the exact probability is obtained by using the binomial formula. If we apply the normal distribution to solve a binomial problem, the probability that we obtain is an approximation to the exact probability. The approximation obtained by using the normal distribution is very close to the exact probability when n is large and p is very close to 50.

Normal distribution as an approximation to binomial distribution usually, the normal distribution is used as an approximation to the binomial distribution when np and nq are both greater than 5 - that is, when

$$np > 5 \text{ and } nq > 5.$$