STA 101.1

Reg. No. ....

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION
OCTOBER 2012
STATISTICS
DESCRIPTIVE STATISTICS & PROBABILITY - I

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2X10=20**

1. a) Distinguish between primary and secondary data.

   b) Define 'Sample'. Give an example.

   c) Write down any two merits of Geometric Mean.

   d) Define coefficient of variation and mention a use of it.

   e) State the axiomatic definition and probability.

   f) Define the term 'Event' and give an example for it.

   g) Prove that $V(ax + b) = a^2 V(x)$.

   h) Define convergence in probability.

   i) Write down any two differences between positively and negatively skewed distributions.

   j) State the central limit theorem.

   k) Show that $P(A^1) = 1 - P(A)$.

   l) A random variable assumes values 1 and -1 with probabilities p and $q = 1 - p$. Find the mean and variance

PART – B

Answer any TWO of the following: **10x2=20**

2. a) Explain the construction of Histogram.

   b) The values 0, 1,... n have frequencies $n_{C_0}, n_{C_1}, \ldots n_{C_n}$ respectively. Find the A.M (5+5)

3. a) Show that the sum of squared deviations is least when measured from the A.M.

   b) Derive the formula for mode stating the assumptions. (5+5)

4. a) Show that Standard Deviation is not less than Mean Deviation from mean.

b) Explain the construction of Box plot. Mention the uses of it. **(5+5)**

Answer any TWO of the following: **10x2=20**

5. a) If $B \subset A$, then (i) $P(A \cap \bar{B}) = P(A) - P(B)$

(ii) $P(B) \leq P(A)$

b) Define conditional probability. Show that it satisfies axioms of probability. **(5+5)**

6. a) State and prove Baye's theorm of probability.

b) In an office, there are 3 typists A, B and C. They do respectively 25%, 35% and 40% of the total typing work. The probabilities of each of these making errors while typing a letter are 0.1, 0.15 and 0.25. If a typed letter has errors, find the probability that it has been typed by typist C.. **(5+5)**

7. a) Define random variable, p.m.f., p.d.f. and c.d.f. Write down the properties of c.d.f.

b) $A_1, A_2, \ldots A_k$ are K dependent events with respective probabilities $p_1, p_2, \ldots p_k$. Show that the probability of occurrence of at least one of these events is $1 - [(1 - p_1)(1 - p_2) \ldots\ldots (1 - p_k)]$

(6+4)

Answer any TWO of the following: **10x2=20**

8. a) Define cumulant generating function. State and prove additive property of cumulants.

b) State and prove Tchebychev's inequality. **(5+5)**

9. a) Verify whether X and Y are independently distributed if,

$$p(x,y) = \frac{1}{n^2}, \quad \begin{matrix} x = 1,2 \ldots. n \\ y = 1,2 \ldots. n \end{matrix}$$

b) Define M.G.F. Show how does it generates moments. **(5+5)**

10. a) State and prove multiplication theorem of expectation.

b) If $f(x, y) = 2, \; 0 < x < 1, \; 0 < y < x$.
Find the marginal p.d.f's of X and Y and verify whether X and Y are independent

(5+5)

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STA 101.1 Reg. No. ....

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION
OCTOBER 2013
STATISTICS
DESCRIPTIVE STATISTICS & PROBABILITY - I

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2X10=20**

1. a) What are the sources of secondary data?

   b) Define population give an example.

   c) Write any two properties of Arithmetic Mean.

   d) What do you mean by dispersion?

   e) Define probability density function give an example.

   f) Define pair wise and mutual independence.

   g) Give the empirical definition of probability.

   h) If $V(X) = 1$ find $V\left(-\frac{X}{2} + 2\right)$

   i) State the Lindburg Levy Central limit theorem.

   j) Write any two properties of M.G.F.

   k) Define conditional probability distribution.

   l) Show that $P(A^c) = 1 - P(A)$.

PART – B

Answer any TWO of the following: **10x2=20**

2. a) Distinguish between
   (i) Variable and attribute
   (ii) Primary and Secondary data

   b) Describe the construction of Box Plot. How do you analyze the data. **(5+5)**

3. a) Find the A.M., G.M., and H.M. of $a, ar, ar^2, \dots\ ar^{n-1}$ and S.T. $G^2 = A.H$.

   b) Derive the expression of combined standard deviation of two sets of observation. **(5+5)**

4. a) Derive the expression of r^{th} central moments in terms of raw moments.

b) Stating the assumptions derive the expression for mode of a continuous variable.

(5+5)

Answer any TWO of the following: **10x2=20**

5. a) State and prove multiplication theorem of probability.

b) $A_1 A_2 \dots A_k$ are k independent events with $P(A_1) = \frac{1}{i+1}$ $i = 1, 2, \dots k$.
Find the probability that at least one of these events. (5+5)

6. a) An experiment has two outcomes namely success and failure. The probability of success is p and that of failure is $q = 1 - p$. If the experiment is conducted n times independently, find the mean and variance of the number of successes.

b) Given $P(A) = a$, $P(B) = b$, $P(A \cap B) = C$ .Find the probability that
(i) A alone occurs (ii)A alone occurs or B alone occurs. (5+5)

7. a) Show that if A and B are independent events then
(i) A and B^C are independent
(ii) A^C and B^C are independent events

b) Define random variable, p.m.f. and C.D.F. write down the properties of C.D.F. (6+4)

Answer any TWO of the following: **10x2=20**

8. a) Define C.G.F. Write down its properties.

b) State and prove Tchebychev's inequality. (5+5)

9. a) Verify whether X and Y are independently distributed.

$$f(x,y) = \begin{cases} \frac{(x+2y)}{18} & (x, y) = (1, 1), (1, 2), (2, 1), (2, 2) \\ 0 & \text{O.W.} \end{cases}$$

b) State and prove addition theorem of expectation. (5+5)

10. a) If $f(x, y) = 2 - x - y$ $0 \leq x \leq 1$ $0 \leq y \leq 1$
Find the conditional distributions.

b) Define M.G.F. Find the M.G.F. of the distribution $f(x) = \frac{1}{b-a}$ $a \leq x \leq b$. (5+5)

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STA 101.1 Reg. No. ....

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2014

STATISTICS

DESCRIPTIVE STATISTICS & PROBABILITY - I

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: 2x10=20

1. a) Explain the terms with an example each:

   (i) Population (ii) Attribute

   b) For a set of values 2, 4, 6, 8, show that $\sum(x-\bar{x})^2$ is minimum.

   c) Which are the situations where

   (i) Median is preferred to mean?

   (ii) Mode is preferred to mean?

   d) Define 'Standard Deviation' and 'Variance'.

   e) Define β_2 and how it is used to study Kurtosis?

   f) Define Mutually Exclusive and equally likely events with one example each.

   g) Give the axiomatic definition of probability.

   h) What are the properties of p.m.f.?

   i) If $P(x)=\frac{1}{K}, X=1,2.......K$ Find $E(x)$.

   j) Show that $E(ax+b)=a\,E(x)+b$.

   k) State Central Limit Theorem.

   l) A random variable x has mean 5 and variance 3. What value of 'h' guarantees that Prob $[|X-5|<h]\geq 0.99$?

PART – B

Answer any TWO of the following: 10x2=20

2. a) Distinguish between Primary and Secondary data. What are the sources of Primary data?

   b) The values 0, 1, 2,...... n have frequencies $n_{e_0}, n_{e_1}, ...n_{e_n}$ respectively find A.M.

   (5+5)

3. a) Show that standard deviation is not less that mean deviation from mean.

   b) Standing the assumptions derive an Expression for the mode of a continuous frequency distribution. **(5+5)**

4. a) Explain the construction of Box plot. What are the uses of Box plot?

   b) What are raw and central moments of a distribution? Express r^{th} central moment in terms of raw moments. **(5+5)**

Answer any TWO of the following: **10x2=20**

5. a) If A and B are two independent events, show that

   (i) A and B^C are independent.

   (ii) A^C and B^C are independent

   b) State and prove the addition theorem of probability for any 2 events. What happens if the events are mutually exclusive. **(5+5)**

6. a) $A_1 A_2 \dots A_k$ are k independent events with $P(A_i) = 1 - \alpha^{-i}, i = 1, 2 \dots\dots, K$. Find the probability that at least one of these events occur.

   b) Define Random variable, p.m.f., p.d.f. and cumulative distribution function. **(5+5)**

7. a) State and prove Baye's theorem of inverse probability.

   b) In an office, there are three typists A, B and C. They do respectively 25%, 35% and 40% of the total typing work. The probabilities of each of these making errors while typing a letter are 0.1, 0.15 and 0.25. If a typed letter has errors, find the probability that it has been typed by typist C. **(5+5)**

Answer any TWO of the following: **10x2=20**

8. a) Define MGF of a random variable. Examine the effect of change of origin and scale on MGF.

   b) Joint density of X and Y is $f(x,y) = \begin{cases} 8xy & 0 \le x \le 1; 0 \le y \le 1 \\ 0 & otherwise \end{cases}$ **(5+5)**

   Verify whether X and Y are independent

9. a) State and prove multiplication theorem of expectation.

   b) Find an Expression for the Variance of a linear combination of random variable. **(5+5)**

10. a) State and prove Tchebyshev's inequality.

    b) A continuous random variable has its p.d.f. $f(x) = 6x(1-x), \quad 0 \le x \le 1$, find mean and standard deviation of the variable. **(5+5)**

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STA 101.1 Reg. No. ....

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2015

STATISTICS

DESCRIPTIVE STATISTICS & PROBABILITY - I

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2x10=20**

1. a) Explain discrete and continuous variables with examples.

b) Distinguish between inclusive and exclusive indervals.

c) Show that algebraic sum of the deviations of a set of values from their mean is zero.

d) Briefly explain how β_2 is used to study Kurotsis.

e) Define Mutually Exclusive and equally likely events with one example each

f) What is a random experiment? Give one example.

g) Show that $E(ax+b) = aE(X)+b$

h) Find the distribution function of the random variable whose pdf is $f(x) = \frac{1}{\theta} \quad 0 \le x \le \theta$

i) State Central Limit Theorem.

j) Define convergence on probability.

k) Distinguish between p.m.f. and p.d.f.

l) A random variable assumes values 1 and –1 with probabilities p and $q = 1 - p$. Find the Mean and Variance.

PART – B

Answer any TWO of the following: **10x2=20**

2. a) Explain mailed questionnaire method of collecting primary data.

b) What are the desirable properties of a good measure of central tendency. **(5+5)**

3. a) A sum deposited in a bank grows at the rates $r_1, r_2, r_3, \ldots r_n$ in n successive years, obtain the expression of average growth rate.

b) Derive an expression for the medium of a continuous frequency distribution. **(5+5)**

4. a) Obtain an expression for the combined standard deviation of two sets of values.

b) Explain the construction of Box Plot and mention its uses. **(5+5)**

Answer any TWO of the following: **10x2=20**

5. a) With usual notations prove that $0 \le P(A \cap B) \le P(A) \le P(A \cup B) \le P(A) + P(B)$

   b) If A and B are 2 independent events ST

      i) A^1 and B^1 are independent.

      ii) A^1 and B are independent **(5+5)**

6. a) State and prove Baye's theorem of probability.

   b) A firm has three machine operators X, Y & Z. Their contributions for the productions of a product are respectively 25%, 35% and 40%. The probabilities of producing items of substandard quality are 0.05, 0.07 and 0.1 respectively. If the selected item is of substandard quality find the probability that it has been operated by the operator Y. **(5+5)**

7. a) State and prove addition theorem of probability for any 2 event.

   b) With usual notations, prove that $V(ax+by) = a^2V(X) + b^2(VY) + 2ab(0V(x,y)$ **(5+5)**

Answer any TWO of the following: **10x2=20**

8. a) Find β_1 & β_2 of the distribution $f(x) = \frac{1}{2}, \quad -1 \le x \le 1$.

   b) Explain how the r^{th} moment can be obtained from m.g.f. **(7+3)**

9. a) State and prove Tchebyshev's inequality.

   b) A random variable takes values 1 and 0 with respective probabilities P and 1 – p. Find its M.G.F. **(5+5)**

10. a) State and prove addition theorem of expectations, for two discrete random variables x & y.

    b) If $f(x,y) = 2 - x - y, \ 0 \le x \le 1$ verify whether X & Y are independent. **(5+5)**

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STA 101.1 Reg. No. ....

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2016

STATISTICS

DESCRIPTIVE STATISTICS & PROBABILITY - I

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2x10=20**

1. a) Distinguish between attribute and variable.

   b) Mention any two merits of sample survey.

   c) Write down any two demerits of A.M.

   d) Define Median and state the minimal property of it.

   e) State any two limitations of classical definitions of probability.

   f) Define Mutually exclusive events with an example.

   g) Show that $V(ax) = a^2V(x)$.

   h) Distinguish between probability mass function and probability density function.

   i) Define cumulant generating function. What is the r^{th} cumulant?

   j) Define β_2. How do you interpret the Kurtosis?

   k) What are null and sure events?

   l) What do you mean by convergence in probability?

PART – B

Answer any TWO of the following: **10x2=20**

2. a) State the properties of A.M.

   b) Find the A.M., G.M. & H.M. of the first n natural numbers. **(3+7)**

3. a) Calculate Mean Deviation from Mean and Standard Deviation of the values a, a+d, …… ,a+2nd.

   b) Derive an expression for Median in case of continuous distribution. **(6+4)**

4. a) Suppose n_1 observations have mean $\bar{x}_1$ and standard deviation σ_1, n_2 observations have been $\bar{x}_2$ and standard deviation σ_2. Derive an expression for the combined standard deviation σ

   b) Define moments. Explain how the first four moments describe the characteristics of a distribution. **(6+4)**

Answer any TWO of the following: **10x2=20**

5. a) If A and B are two independent events, show that

   (i) A and $\overline{B}$ are independent

   (ii) $\overline{A}$ and B are independent

   (iii) $\overline{A}$ and $\overline{B}$ are also independent

   b) If P(A) = 0.4, P(B) = 0.3 and P (A $\cap$ B) = p, find p such that

   (i) A and B are mutually exclusive

   (ii) A and B are independent **(6+4)**

6. a) State and prove Baye's theorem of inverse probability.

   b) If an office, there are 3 typists A, B & C. They do respectively 25%, 35% and 40% of the total typing work. The probabilities of each of these making errors while typing a letter are 0.1, 0.15 and 0.25. If a typed letter has errors, find the probability that it has been typed by typist C. **(5+5)**

7. a) Define Mathematical expectation. State and prove addition theorem of expectation.

   b) If $f(x) = A + Bx, \quad 0 \le x \le 1$ and $E(x) = \frac{1}{2}$. Find A & B. **(6+4)**

Answer any TWO of the following: **10x2=20**

8. a) Define Moment Generating function. Show how does it generate moments.

   b) State and prove Tchebychev's inequality. **(4+6)**

9. a) Explain joint, marginal probability density functions and marginal probability mass functions.

   b) If the joint p.m.f. of X_1 & X_2 be $p(x_1, x_2) = \frac{x_1 + x_2}{21}, \quad x_1 = 1, 2, 3; \; x_2 = 1, 2$

   Find the marginal p.m.f.s of X_1 & X_2.

   (3+7)

10. a) Show that $V\left(\sum_{i=1}^{K_1} a_i X_i\right) = \sum_{i=1}^{K_1} a_i^2 V(X_i) + 2\sum_{\substack{i=1 \\ i<j}}^{K} \sum_{y=1}^{K} a_i a_j COV(X_i, X_j)$

    b) If $f(x, y) = 8xy, \quad 0 < x \le y < 1$. Find the marginal densities of X and Y. **(6+4)**

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