Vivekanand College, Kolhapur (Autonomous)
Department of Statistics
Internal Examination (2023-24)

Notice

Date: 03 /10/2023

All the students of **B.Sc. – I** (Major, Minor & open elective subject) are hereby informed that, the internal examination of **Semester- I** will be held as per following time table.

Sr. No.	Date	Time	Title of the Paper
01	25/10/2023	12.20 pm to 01.10 pm	Descriptive Statistics I
	26/10/2023	12.20 pm to 01.10 pm	Elementary Probability Theory

Nature of Question Paper (Total Marks = 10)

Que. 1) 4 MCQ's each carrying 1 mark

Que. 2) Solve any 2 questions out of 3 (3 X 2 = 6)

(Ms. V. V. Pawar)
HEAD
DEPARTMENT OF STATISTICS
VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)

Vivekanand College, Kolhapur (Empowered Autonomous)
Department of Statistics
B.Sc. I Semester- I
Internal Examination
Subject: Descriptive Statistics I

Wednesday 25/10/2023   Marks:10   Time: 12:20 PM-1:10PM

All questions are compulsory.

Q.1 Select the most correct alternative.   [04]

1. The measurement on height & weight are made on ………scale
   a) nominal   b) ordinal   c) interval   d) ratio

2. Primary data means ………
   a) original data   b) it may be result of survey
   c) it may be result of enquiry   d) All the above

3. mean=25, mode=75 then the value of median is………
   a) 50   b) 75   c) 25   d) none of these

4. The algebraic sum of deviations of observations from their arithmetic mean is …...
   a) minimum   b) zero   c) one   d) greater than zero

Q.2 Define/ Solve the following. (Any two)   [3*2= 06]

   i) SRSWOR

   ii) Combined mean & Harmonic Mean

   iii) Write the formula for mean, median & mode in case of grouped frequency distribution.

Vivekanand College, Kolhapur (Empowered Autonomous)
Department of Statistics
B.Sc. I Sem- I
Internal Examination
Subject: Elementary Probability Theory

Thursday 26/10/2023   **Time12.20PM-1.10PM**

All questions are compulsory.

Q.1 Choose the correct alternative.   [05]

1. If $A \subseteq B$, then $P(A^c \cap B) = \ldots\ldots\ldots$
    a) $P(A)$ b) $P(B)$ c) $P(B)-P(A)$ d) $P(A)-P(B)$

2. Discrete sample space contains ....sample points .
    a) finite   b) infinite   c) countably infinite   d) finite & countably infinite

3. Let A and B be two events defined on sample space, then occurrence of both A and B is ….
    a) $A^c \cap B$ b) $A \cap B$ c) $A \cap B^c$ d) $A \cup B$

4. Which of the following is true?
    a) $P(A \cap B) \leq P(A)$
    c) $P(A \cup B) \leq P(A)+P(B)$
    b) $P(A) \leq P(A \cup B)$
    d) All the above

5. The sample space corresponding to the experiment " Three seeds are planted and total number of seeds germinated are recorded after a week" is…………..
    a) (0,3)   b) {0,1,2,3}   c) {1,2,3}   d) [0,3]

Q.1 Define following terms.(Any two)   [05]
    i) Axiomatic definition of probability
    ii) Exhaustive events
    iii) Sure event..

Vivekanand College, Kolhapur (Empowered Autonomous)
Department of Statistics
B.Sc. II Semester- III
Internal Examination
Subject: Probability Distributions I
Wednesday 25/10/2023   Marks:20   Time: :20 PM-1:10PM

All questions are compulsory.

Q.1 Select the most correct alternative.

[05]

1. If X is a continuous r.v on $(0,\infty)$ with pdf f(x) then geometric mean is given by…..

   a) Antilog[E(X)]   b) Antilog[E $\log(\frac{1}{x})$]

   c) Antilog [E(logX)]   d) Antilog[E(XlogX)]

2. If F(x) is a distribution function and $x_2 > x_1$ then …..

   a) $F(x_2).F(x_1)$ b) $F(x_2) \le F(x_1)$

   c) $F(x_2) \ge F(x_1)$ d) $F(x_2) > F(x_1)$

3. If X is a r.v. with pdf

   f(x)= 1 ; $0 < x < 1$ then its m.g.f is ………..

   a) $\frac{1}{t}(e^t - 1)$ b) $t(e^t - 1)$ c) $t(e^{-t} - 1)$ d) $\frac{1}{t}(e^{-t} - 1)$

4. The value of constant C if the following function is pdf

   f(x) = C ; $-4 \le x \le 4$,   C > 0

   a)1/4   b)1/8   c)1/2   d) none of these

5. If x is a r.v. with pdf

   f(x)= e^{-x} ; $x > 0$

   0   ; o. w   then the value of mean is……

   a) e^1 b) 0   c) 1   d) none of these

Q.2 Attempt any three.   **[5*3= 15]**

1. Suppose X is a r.v with pdf

   f(x)= $\frac{1}{(1+x)^2}$; $x \ge 0$

   If A= $\{x | 1 < x < 9\}$ and B=$\{x | 0 < x < 4\}$

   Then find   i) P(A)   ii) P(B)   iii) P(A∩ B)   iv) P(A∪ B)

2. If a r.v.X has pdf

   f(x) = $\frac{c}{x}$; $1 < x < 3$ then find   i) c   ii) E(x)   iii) V(x)

3. Define the following terms

   i) p.d.f   ii) Distribution function   iii) m.g.f

4. If X has p.d.f ,   f(x) = $\frac{3}{2}x^2$; $-1 \le x \le 1$

   find the pdf of   i) Y=x^2 ii) Y=$|x|$

Q1) Choose Correct Alternative   (1×5 = 5)

i)If $X_2 = aX_1 + bX_3 + c$ is best regression plane of X_2 on X_1 and X_3 then……

   A) $a = b_{23.1}$, $b = b_{21.3}$ B) $a = b_{21.3}$, $b = b_{23.1}$

   C) $a = b_{23}$, $b = b_{32}$ D) $a = b_{23.1}$, $b = b_{32.1}$

ii)Equation of plane of regression of X_3 on X_1 and X_2 is good fit if …….

   A) $R_{1.23} = 1$ B) $R_{2.13} = 1$ C) $R_{3.12} = 1$ D) $R_{1.23} = 0$

iii)The necessary and sufficient condition for three planes X_1 on X_2 and X_3, X_2 on X_1 and X_3, X_3 on X_1 and X_2 are coincident is …….

   A) $r_{12} + r_{13} + r_{23} - 2r_{12}r_{13}r_{23} = 1$ B) $r_{12} + r_{13} + r_{23} - 2r_{12}r_{13}r_{23} = 0$

   C) $r^2_{12} + r^2_{13} + r^2_{23} - 2r_{12}r_{13}r_{23} = 1$ D) none of these

iv) The correct relationship between $R^2_{1.23}$ and r_{12} is………

   A)$1 - R^2_{1.23} = (1 - r^2_{12})(1 - r^2_{13.2})$ B) $R^2_{1.23} = (1 - r^2_{12})(1 - r^2_{13.2})$

   C)$1 - R^2_{1.23} = (1 - r^2_{13})(1 - r^2_{13.2})$ D) $R^2_{1.23} = (1 - r^2_{13})(1 - r^2_{1.23})$

v) Let $X_1 = Y_1 + Y_2$, $X_2 = Y_2 + Y_3$, $X_3 = Y_1 + Y_3$ where Y_1, Y_2 and Y_3 are mutually uncorrelated variables with mean 0 and standard deviation 1 then value of $R_{1.23} = $ ……

   A)$\frac{1}{\sqrt{3}}$ B)$\frac{1}{3}$ C)$\frac{1}{3}$ D)$\frac{1}{\sqrt{3}}$

Q2) Attempt any Two   (2×5 = 10)
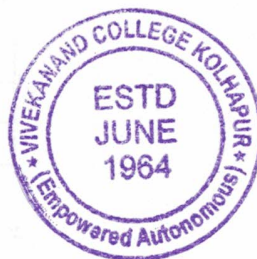
ii) State the formulae of equations of three regression planes and all partial regression coefficients.

ii) Show that partial correlation coefficient is the geometric mean of two partial regression coefficients.

iii) If total corelation coefficients $r_{12} = r_{13} = r_{23} = \rho$ ($\rho \ne +1$ or -1) then show that

   $1 - R^2_{1.23} = \frac{(1-\rho)(1+2\rho)}{1+\rho}$

Vivekanand College, Kolhapur (Empowered Autonomous)
Department of Statistics
B.Sc – III Internal Examination (2023-24)

Notice

Date: 03/10/2023

All the students of B.Sc. – III are hereby informed that, the Internal Examination of Semester – V will be held as per following time table.

Sr.No.	Date	Time	Paper No.
1	18/10/2023	12.15pm to 01.15pm	Paper – IX : Probability Distributions
2	19/10/2023		Paper – X : Statistical Inference-I
3	20/10/2023		Paper – XI : Sampling Theory
4	21/10/2023		Paper – XII : Operation Research

Nature of Question Paper (Total Marks = 15)

Que. 1) 5 MCQ's each carrying 1 mark

Que. 2) Solve any 2 questions out of 3 (5 X 2 = 10)

(Ms. Pawar V. V.)
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Department of Statistics
B.Sc. III Sem V Internal Examination 2023-24

Paper IX: Probability Distributions

Total Marks 15   Time:12.15 pm to 1.15 pm   Date :18/10/2023

Q1) Choose Correct Alternative   (1×5 = 5)

1) The variance of Logistic distribution with parameters μ and σ is......

a) $\frac{\sigma^2 \pi^2}{3}$ b) $\frac{\sigma^2 \pi^2}{3}$ c) $\frac{\sigma^2}{3}$ d) $\frac{\sigma^2 \pi^3}{6}$

2) Mode of Parato distribution with parameters a=3 and b=2 is ......

a) 6   b) 2   c) 8   d) 3

3) If $(X, Y) \sim BN\ (\mu_1, \mu_2,\ \sigma_1^2,\ \sigma_2^2, \rho)$ then $E\ (X\ |\ Y = y)$ is

a) μ_1 b) μ_2 c) $\mu_1 + \rho \frac{\sigma_1}{\sigma_2}(y - \mu_2)$ d) $\mu_1 + \rho \frac{\sigma_2}{\sigma_1}(y - \mu_2)$

4) If $x_1,\ x_2, ..., x_n$ are i.i.d. standard Cauchy Variables then $\bar{x}$ follows:

a) $C\ (n,\ n^2)$ b) $C\ (n,\ n)$ c) $C\ (\mu, \lambda)$ d) $C\ (0,\ 1)$

5) If X follows Lognormal distribution with parameter μ=5 and σ=2 then mean and mode of X are.........

a) (e^7, e^1) b) (e^1, e^7) c) (e^3, e^1) d) (9,1)

Q2) Attempt any Two   (2×5 = 10)

a) Define multinomial distribution. Obtain Moment generating function (m.g.f.) of multinomial distribution.

b) Define Weibull distributes with parameters α and β. find mean and C.V. of the Weibull distribution.

c) Define Laplace distribution with parameters (μ, λ). Obtain mean deviation about mean of Laplace (μ, λ).

Vivekanand college, Kolhapur (Empowered Autonomous)
Department of Statistics
B.Sc. III Sem V Internal Examination 2023-24
Paper X: Statistical Inference I

| Total Marks 15 | Time:12.15 pm to 1.15 pm | Date :19/10/2023 |

Q1) Choose Correct Alternative

$(1 \times 5 = 5)$

1. If $\bar{x}$ is sufficient for μ then ..... is sufficient for μ^2.
   a) $\bar{x}$ b) $\bar{x}^2$ c) both a) and b)   d) none of these

2. If $X_1, X_2 .... X_n$ is a random sample from a population $N(\mu, \sigma^2) then \sum \frac{x_i}{n}$ is ....
   a) Unbiased for μ c) Sufficient for μ
   b) Consistent for μ d) All the above

3. The standard error of an unbiased estimator of μ based on a random sample of size 100 from
   N (μ, 100) is--------
   a) 5   b) 2   c) 10   d) 1

4. If T is unbiased estimator of θ, a and b are two integers then ....
   a) T^2 unbiased estimator of θ^2 b) aT+ b is unbiased estimator of θ
   c) aT+b is unbiased estimator of aθ + b   d) T is unbiased estimator of aθ + b

5. The sufficient statistic for σ^2 of N (0, σ^2) based on a single observation x is ....
   a) x^2 b) x   c) $|x|$ d) 2x

Q2) Attempt any Two

$(2 \times 5 = 10)$

1. If T_1 & T_2 be two unbiased estimators of θ having same variance. Show that correlation coefficient between T_1 & T_2 is greater than (2e-1) where e is the efficiency of T_2 w.r.t T_1.

2. Define sufficient statistic based on Neyman factorization criteria. The continuous r.v. X has following p.d.f.   f (x, θ) = $e^{-(x-\theta)}$;x $\geq \theta$
   0   ;o.w
   Find sufficient statistic for θ.

3. Show that sample mean square is unbiased & consistent estimator of population variance.
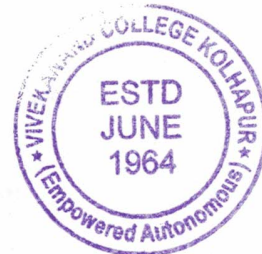
Vivekanand college, Kolhapur (Empowered Autonomous)
Department of Statistics
B.Sc. III Sem- V
Paper N0.-XII Internal Examination
Subject: Sampling Theory

| Tuesday 20/10/2023 | (Total marks 20) | Time 12.15pm-1.15pm |

All questions are compulsory.

Q.1 Choose the correct alternative.   [05]

1. For a large population with population variance S^2 confidence coefficient (1-α) and margin of error 'd' the size of SRSWOR will be:
   a) $\frac{z_{\alpha/2}^2 S^2}{d^2}$ b) $\frac{z_{\alpha/2}^2}{S^2 d^2}$
   c) $\frac{z_{\alpha/2}^2 S^2}{2d^2}$ d) none of these

2. List of all the units of the population is called ....
   a) Random sampling   b) Bias
   c) Sampling frame   d) probability sampling

3.) In optimum allocation for a fixed cost ,large sample would be required from a stratum if ....,
   a) sampling cost per unit is low in the stratum   b) stratum size is large
   c) stratum variability (Si) is large   d) All of these

4. In stratified random sampling with stratum sizes N1=800, N2=300 and stratum variability S_1 = 144, S_2= 400 respectively, then under Neyman allocation, the ratio of sample sizes n1/n2 is given by ----
   a)   1.96   b) 0.96
   c) 1.94   d) None of these

5. Sampling error can be reduced by ....
   a) Non probability sampling   b) Decreasing the sample size
   c) Increasing the population size   d) Increasing the sample size

Q.2 Solve the following.   [15]

1. In SRSWOR prove that variance of sample mean is $\frac{N-n}{N} * \frac{S^2}{n}$

2. Explain Stratified random sampling. Prove that $\bar{y}_{st}$ is an unbiased estimate of population mean $\bar{Y}$.

3. Write note on sampling and non-sampling errors.

Vivekanand College, Kolhapur (Empowered Autonomous)
Department of Statistics
B.Sc.-III Sem-V Internal Examination 2023-24
Paper XII: Operations Research
Time: 12.15 pm to 1.15 pm   Date:

Marks: 20

21/10/2023

Instructions: All questions are compulsory.

Each question carries equal marks.

Q1. Select the most correct alternative   [5]

1. A variable is used to convert $\leq$ inequality to equation is called as …

    a) Surplus b) Slack c) Artificial d) Basic

2. The method of solving Transportation problem is known as …

    a) MODI method b) reduced matrix method c) Hungarian method d) None of the above

3. In Big-M method, where M is very big number is the cost of …

    a) Slack variables b) Surplus variables c) Basic variables d) Artificial variables

4. The Assignment problem is said to be balanced if, …

    a) No. of rows < No. of columns

    b) No. of rows > No. of columns

    c) No. of rows = No. of columns

    d) All of the above

5. If dual has unbounded solution, then primal has …

    a) No feasible solution b) unbounded solution c) feasible solution d) none of the above

                                                                               [10]

Q2. Attempt any two out of three

1. Define the following terms.

    a) Solution b) Basic solution c) Slack variable.

2. Distinguish between Transportation problem and Assignment problem.

3. Explain Big M method to solve linear programming problems.