Notice

Date: 13/09/2024

All the students of M.Sc. – I & II (Statistics & Applied Statistics) are hereby informed that, the Internal Examination of Semester – I & III will be held as per following time table.

M.Sc. – I (Statistics & Applied Statistics)

Sr.No.	Date	Time	Marks	Course Code	Course Name
1	24/09/2024	11.15 am to 12.15 pm	20	DSC17STA11 / DSC18STA11	Distribution Theory
2	25/09/2024		20	DSC17STA12/ DSC18STA12	Estimation Theory
3	26/09/2024		10	DSC17STA13/ DSC18STA13	Statistical Computing
4	27/09/2024		20	DSE17STA11	Mathematical Statistics
				DSE18STA11	C Programming
5	28/09/2024		20	RMD17STA11/ RMD18STA11	Research Methodology

M.Sc. – II (Statistics & Applied Statistics)

Sr.No.	Date	Time	Marks	Course Code	Course Name
1	24/09/2024	11.15 am to 12.15 pm	20	DSC17STA31 / DSC18STA31	Stochastic Processes
2	25/09/2024		20	DSC17STA32 / DSC18STA32	Statistical Learning & Data Mining
3	26/09/2024		20	DSC17STA33 / DSC18STA33	Python Programming
4	27/09/2024		20	DSE17STA32	Generalised Linear Model
			20	DSE18STA32	Statistical Quality Control

Nature of Question Paper

a) For 20 Marks :-

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

Que. 2) Attempt any 3 questions out of 4 (5 X 3 = 15)

b) For 10 Marks :-

Que. 1) 2 MCQ's each carrying 1 mark

Que. 2) Attempt any 2 questions out of 3 (4 X 2 = 8)

Instruction :- Students should present at least 09 min. before examination.

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

Marks: 20   **Time: 11:15 AM to 12:15PM**   **Date: 24/09/2024**

Question 1. Multiple choice questions   **5M**

1) If F is distribution function of X then which of the following is/are true?

(A) $F(x_1) \geq F(x_2)$ for $x_1 < x_2$ (B) $\lim_{h \to 0} F(x - h) = F(x)$

C) $F(-\infty) = 0$ and $F(\infty) = 1$ (D) All are correct

2) If $X \sim G(\alpha, \lambda_1)$ independent on $Y \sim G(\alpha, \lambda_2)$ then $E\left(\frac{X}{X+Y}\right)$ is

(A) $\frac{\lambda_1}{\lambda_2}$ (B) $\frac{\lambda_2}{\lambda_1}$ (C) $\frac{\lambda_1}{\lambda_1 + \lambda_2}$ (D) $\frac{\lambda_2}{\lambda_1 + \lambda_2}$

3) If random variable Y is defined on continuous random variable X then Y can be…type r.v.

(A) Continuous (B) Discrete   (C) Mixture   (D) All of these

4) Let 'a' and 'b' be the two real numbers where a<b, and X be discrete random variable, then P (a ≤ X < b) = ………….

(A) F(b)-F(a)   (B) F(b)-F(a)+P(a)
(C) F(b)-F(a)-P(b)   (D) F(b)-F(a)-p(b)+p(a).

5) Let X is random variable with density $f(x) = \frac{1}{k} \exp\left\{-\frac{1}{2}\left(\frac{x-4}{2}\right)^2\right\}$ then value of k is

(A) $\sqrt{2\pi}$ (B) $\sqrt{8\pi}$ (C) $\sqrt{4\pi}$ (D) $\sqrt{\pi}$

Question 2. Attempt any 3 questions out of 4 questions   **15M**

1. If X and Y are $i.i.d.$ standard uniform variates then find density of $(X - Y)$
2. Define distribution function of random variable. State it's all properties.
3. If $X \sim U(-2,3)$, find distribution of $Y = X^+$.
4. If distribution function of r. v. X is

$$F(x) = \begin{cases} 0; x < 0 \\ 0.5 + \dfrac{x}{2}; 0 \leq x < 1 \\ 1; x \geq 1 \end{cases}$$

then decompose F into distribution function of discrete part and continuous part. Also find $E(X)$

_____******_____

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

i) Let 5, 8, 3, 6, 8 are observations from exp (mean λ) then unbiased estimate of λ is
    a) 3   b) 6   c) 5   d) 8

ii) If $X_1, X_2 \dots X_n$ is a random sample of size n from N (θ, θ^2) then minimal sufficient statistic for θ is
    a) $(\sum_{i=1}^{n} x_i , \sum_{i=1}^{n} x_i^2)$ b) $\sum_{i=1}^{n} x_i$ c) $\sum_{i=1}^{n} x_i^2$ d) None of these

iii) M.L.E is same as moment estimator if the distribution
    a) belongs to exponential family   b) holds regularity conditions
    c) has support free from parameter of estimation   d) has unique M.L.E.

iv) Moment estimator of θ based on random sample of size n from U(θ ,1) is
    a) $2\bar{X} + 1$ b) $2\bar{X} - 1$ c) $\bar{X} - 2$ d) $2\bar{X} - 2$

v) The sufficient estimator of the parameter λ of Poisson distribution based on a sample X_1, X_2, X_3 is given by
    a) $X_1+X_2+X_3$ b) $X_1+2X_2+X_3$ c) $X_1+X_2+2X_3$ d) $2X_1+X_2+X_3$

Q2) Attempt any Three   **(3×5 = 15)**

i) Suppose $X_1, X_2, \cdots, X_n$ is a random sample from U $(0, \theta)$ distribution then obtain complete sufficient statistics for θ.

ii) Define one parameter exponential family of distributions. Obtain minimal sufficient statistic for this family.

iii) Let $X_1, X_2, \cdots, X_n$ be a random sample from P (λ) where 0<$\lambda \leq$ 2 then find the MLE of λ .

iv) Let $X_1, X_2, \cdots, X_n$ be a random sample from N $(\mu,1)$. Show that $\frac{\sum X_i^2}{n} - 1$ is unbiased estimator of μ^2

Q1) Choose Correct Alternative   **(1×2 = 2)**

i) _____function in MS Excel worksheet represents the total number(s) of entries in the cell(s).
    a) SUM   b) AVG   c) COUNT   d) TOTAL

ii) Which one is not a function in ms excel?
    a) PROPER   b) AVERAGE   c) COUNT   d) CLEAR

Q2) Attempt any Two   **(2×4 = 8)**

iii) Discuss the analysis tool pack in MSEXCL.

ii) Explain functions/procedure in MSEXCEL for the following
    a) To compute correlation coefficient between two variables
    b) To compute CDF of normal distribution
    c) To generate random numbers from U (1,10) distribution
    d) To compute geometric mean of numbers

iii) Write note on Data Manipulation in MSEXCEL

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

   i)   Which data type is used to store a single character in C?
           A) int   B) char   C) float   D) double
   ii) Which loop is used to iterate over a block of code for a specified number of iterations?
           A) while   B) for   C) do-while   D) if-else
   iii) Which of the following is a characteristic of an algorithm?
           A) Ambiguity   B) Finiteness   C) Complexity   D) Redundancy
   iv) What is the purpose of the malloc () function in C?
           A) Allocate memory dynamically   B) Deallocate memory dynamically
           C) Initialize memory   D) Free memory
   v)   How are arrays passed to functions in C?
           A) By value   B) By reference   C) By address   D) By pointer

Q2) Attempt any Three   **(3×5 = 15)**
   iv) Describe the if-else statement in C. Explain its syntax and usage.
   v) Explain the different types of operators in C also provide example of each.
   iii) Describe the symbols used in a flowchart and their meanings. Explain the importance
       of each symbol.
   iv) Describe the concept of pointers in C. Explain their declaration, initialization, and usage.

Vivekanand college, Kolhapur (Empowered Autonomous)
Department of Statistics
M.Sc. I Sem I (Statistics / Applied Statistics) Internal Examination 2024-25
Course Name: mathematical statistics
Date :27/09/2024   Time:11.15 am to 12.15 pm   Total Marks 20

Q1) Choose Correct Alternative   **(1×5 = 5)**
   i) Statement I) Every convergent sequence is bounded.

   Statement II) If an infinite series $\sum_{n=1}^{\infty} a_n$ converges then $\lim_{n\to\infty} a_n = 0$

      a) only (I)true   b) only (II)true   c) both (I) & (II) true   d) both (I) & (II) false.

   ii) The series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges if

      a) p > 0   b) p > 1   c) n < 1   d) n > 0
   iii) Which of the following is/are subspaces of $\mathbb{C} \times \mathbb{R} \times \mathbb{R}[\mathbb{R}]$
      a) $\{(0,0,0)\}[\mathbb{R}]$ b) $\mathbb{R} \times \mathbb{R} \times \mathbb{R}[\mathbb{R}]$ c) $\mathbb{R} \times \mathbb{R} \times \mathbb{R}[\mathbb{Q}]$ d) both (a) & (b)
   iv) A monotonic sequence $\{a_n\}$ is convergent iff it is …
      a)   bounded   b) unbounded   c) countable   d) uncountable.
   v) If M & N are subspaces of vector space V then which of the following is/are also subspace.
      a) M∪N   b) M∩N   c) M − N   d) none.

Q.2) Attempt any three.   **[15]**

   i) Discuss the convergence of the sequence $\left\{n^{\frac{1}{n}}\right\}$.

   ii) Test the convergence of the series $\frac{1}{5.9} + \frac{1}{6.11} + \frac{1}{7.13} + \frac{1}{8.15} + \cdots$

   iii) Discuss the convergence of the sequence $\left\{\frac{1 + 2^{\frac{1}{2}} + 3^{\frac{1}{3}} + \cdots + n^{\frac{1}{n}}}{n}\right\}$.

   iv) Show that $W = \{(x, y, z)|x + y = 0\}$ is subspace of $F^3(F)$.

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

1) The ratio estimator is more precise than SRSWOR estimator for the population total if …

   A) $\rho > \frac{1}{2}\frac{c_x}{c_y}$ B) $\rho > \frac{c_x}{c_y}$ C) $\rho > \frac{1}{2}\frac{c_y}{c_x}$ D) $\rho > \frac{c_y}{c_x}$

2) Horvitz-Thompson estimator has a variance smaller then the sample mean because,
   A) Horvitz-Thompson estimator assumes probabilities proportional to the size of   sampling units
   B) Horvitz-Thompson estimator assumes simple random sampling for selecting of the sample
   C) Horvitz-Thompson estimator assigns unequal weights to sampling units
    D) Horvitz-Thompson estimator is similar to ratio estimator

3) In stratified random sampling with stratum sizes $N_1 = 800, N_2 = 300$ 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) 1.60   B) 0.96   C) 2.67   D) 1

4) For an SRSWOR (N, n), the probability that a specified unit is included in the sample is,

   A) $\frac{1}{N}$ B) $\frac{n}{N}$ C) $\frac{1}{(^NC_n)}$ D) $\frac{1}{N(N-1)}$

5) In sample survey one can have the following error _____.
   A) Sampling error   B) non-Sampling error
   C) Both sampling and non-sampling error   D) No error

Q2) Attempt any Three   **(3×5 = 15)**

a) With usual notations, in linear systematic sampling, show that
$$V(\bar{y}_{sys}) = \frac{N-1}{N}S^2 + \frac{n-1}{n}S^2_{wsy}.$$

b) Develop a Des-Raj estimator for sample of size two and show that it is unbiased estimator of population total.

c) Explain with example Lahiri's method of drawing sample in PPSWR sampling.

d) What is the problem of non-response? Also explain Deming technique for the effect of call-backs.

******END******

Vivekanand college, Kolhapur (Empowered Autonomous)
Department of Statistics
M.Sc. I Sem I (Statistics / Applied Statistics) Internal Examination 2024-25

Course Name: Stochastic Process

Date :24/09/2024   Time:11.15 am to 12.15 pm   Total Marks 20

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

i) If $F_{11} = 1$ then state 1 is ………
   a. a) Transient   b) recurrent   c) state with period one   d) none of these

ii) Stationary distribution of Markov chain $\{X_n, n \geq 0\}$ whose one step t.p.m is
$\begin{bmatrix} 1/3 & 2/3 \\ 3/4 & 1/4 \end{bmatrix}$ is …..
   a. a) $\left[\frac{7}{17}, \frac{11}{17}\right]$ b) $\left[\frac{9}{17}, \frac{8}{17}\right]$ c) $\left[\frac{4}{7}, \frac{3}{7}\right]$ d) $\left[\frac{5}{9}, \frac{4}{9}\right]$

iii) The maximum temperature of particular city on n^{th} day is a example of ……….
   a) discrete time, continuous state space.
   b) discrete time, discrete state space.
   c) continuous time, continuous state space.
   d) continuous time, discrete state space.

iv) One step of Markov chain $\{X_n, n \geq 0\}$ whose state space is $\begin{bmatrix} 0 & 1 \\ q & p \end{bmatrix}$ and initial
   distribution of markov chain is uniform distribution then $P[X_2 = 1]$ is …….
   a. a) $q - \frac{q^2}{2}$ b) $1 - q + \frac{q^2}{2}$ c) $1-q$ d) $\frac{q}{2}$

v) A one step t.p.m is $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ 0 & 1 \end{bmatrix}$ then absorbing state is ………...
   a. a) 0   b) 1   c) 0 and 1   d) none of these

Q2) Attempt any Three   **(3×5 = 15)**

i) Consider one step t.p.m. $P = \begin{bmatrix} 3/4 & 1/4 & 0 \\ 1/4 & 1/2 & 1/4 \\ 0 & 3/4 & 1/4 \end{bmatrix}$ with state space S= {0,1,2} and
   initial probability distribution is P[X₀=i] = 1/3, i=0,1,2 then obtain
   a. a) P [X₂ =2, X₁ =1|X₀= 2]   b) P [X₃=1, X₂ =2, X₁ =1, X₀= 2]

ii) Consider a Markov chain having t.p.m $P = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1/4 & 1/8 & 1/8 & 1/2 \end{bmatrix}$.
   Find stationary probability distribution of Markov chain

iii) Define transition probability matrix (TPM). Consider that particle may be at position
   r, r=0, 1, 2, …, k (k>0) of the x-axis. From state r it move to (r+1), $1 \leq r \leq k-1$ with
   probability p or to (r-1) with probability q= 1-p. As soon as it reaches to state 0 it
   remains there with probability a (0<a<1) and is reflected to state 1 with probability (1-
   a); if it reaches to state k it remains there with probability b (0<b<1) and is reflected
   to state k-1 with probability (1-b). Construct the TPM.

iv) Prove that finite irreducible Markov chain is ergodic.

Vivekanand college, Kolhapur (Empowered Autonomous)
Department of Statistics
M.Sc. II Sem III (Statistics / Applied Statistics) Internal Examination 2024-25
Course Name: Statistical Learning & Data Mining
Date :25/09/2024   Time:11.15 am to 12.15 pm   Total Marks 20

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

1.Decision tree is used in
    a) Clustering   b) Prediction   c) Classification   d) All of the above

2.Which of the following strategy is not used for data transformation?
    a) smoothing   b) normalization   c) summarization   d) filling in missing values

3. In Min-max normalization the data values are transformed in such a way that the new
  Values lie in the interval……….
    a) (-1,1)   b) (-1,0)   c) (0,1)   d) (0,∞)

4. Which of the following refers to the task of inferring a model from labelled training data?
    a) Unsupervised learning   b) Supervised learning
    c) Reinforcement learning   d) None of the above

5. The full form of KDD is -----
    a) Knowledge Database   b) Knowledge Discovery Database
    c)Knowledge Data House   d) Knowledge Data Definition

Q2) Attempt any Three   **(3×5 = 15)**
    a) Explain different attribute selection measures in decision tree.
    b) Explain KNN technique. How does it work?
    c) Explain logistic regression in detail.
    d) Define data warehouse. Explain various steps in data preprocessing.

Vivekanand college, Kolhapur (Empowered Autonomous)
Department of Statistics
M.Sc. II Sem III (Statistics / Applied Statistics) Internal Examination 2024-25
Course Name: Python Programming
Date :26/09/2024   Time:11.15 am to 12.15 pm   Total Marks 10

Q1) Choose Correct Alternative   **(1×2 = 2)**
  i)   Which of the following is an immutable data type in Python?
    a.   A) List   B) Tuple   C) Dictionary   D) Set
  ii) Which control statement is used to execute a block of code if a condition is true?
    a.   A) if   B) else   C) for   D) while

Q2) Attempt any Two   **(2×4 = 8)**

    a) Describe the different types of arithmetic operators in Python 3. Provide examples
    for each type. Explain their precedence and associativity.
    b) Describe the characteristics of the string data type in Python 3. How can strings be
    manipulated?
    c) Explain the concept of boolean data type in Python 3. How is it used in
    conditional statements?

....
....

Q.1) Select the most correct Alternative. (5)

   1) The control chart for ……... is also called as u chart.
     a) nonconformities   b) fraction nonconforming
     c) nonconformities per unit   d) process mean

  2) The control chart designed to deal with the defects or nonconformities of a product, is called as ……
    a) p chart   b) c chart   c) R chart   d) s chart

  3) S chart is used to monitor ………of a quality characteristic.
    a) Mean   b) Range   c) variability   d) Attributes

  4) EWMA charts are better than Shewhart control charts in detecting the ……. shifts.
    a) Large process   b) Medium process   c) Small process   d) Every process

  5) Which of these is a disadvantage of Shewhart control charts?
    a) Can be for both attributes and variables   b) Gives process information
    c) Using only the information about the last sample observations
    d) Uses every information about the process

Q.2) Attempt any three (15)

  1) Describe the tree diagram with example.
  2) Describe the graphical tools boxplot and normal probability plot.
  3) Describe construction of p chart.
  4) Describe in general the design and implantation of a Shewhart control chart.