

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION DECEMBER 2023
(Second Semester)

Branch – STATISTICS

DISTRIBUTION THEORY

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (5 x 1 = 5)

- 1 If the variables X and Y are transformed as $U=X-Y$ and $X-X$, then the Jacobian of transformation is
(i) -1 (ii) 2
(iii) 1 (iv) 0
- 2 The mean of zero truncated Poisson distribution is _____.
(i) $\frac{\lambda}{1-e^{-\lambda}}$ (ii) $\frac{\lambda}{1+e^{-\lambda}}$
(iii) $\frac{\lambda}{1-e^{\lambda}}$ (iv) $\frac{\lambda}{e^{-\lambda}}$
- 3 If X is a p-component column vector and $X \sim MVN(\mu, \Sigma)$ then what is the distribution of $Y=cX$.
(i) $Y \sim MVN(c\mu, \Sigma c')$ (ii) $Y \sim MVN(c\mu, c\Sigma c')$
(iii) $Y \sim MVN(c\mu, c\Sigma)$ (iv) $Y \sim MVN(c\mu, cc')$
- 4 The relationship between T^2 and D^2 is
(i) $T^2 = \frac{N_1 N_2}{N_1 - N_2} D^2$ (ii) $T^2 = \frac{N_1 N_2}{N_1 + N_2} D^2$
(iii) $T^2 = \frac{N_1 - N_2}{N_1 + N_2} D^2$ (iv) $D^2 = \frac{N_1 N_2}{N_1 + N_2} T^2$
- 5 Principal component is a -----of random variables.
(i) Non linear combination (ii) Linear combination
(iii) Product (iv) Ratio

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 3 = 15)

- 6 a Derive the distribution of zero truncated Binomial distribution.
OR
b Derive the distribution of zero truncated Poisson distribution.
- 7 a Obtain the probability density function of nth order statistic.
OR
b How will you find the joint distribution of any two order statistics?
- 8 a Derive the MLE of the mean vector of Multivariate Normal distribution.
OR
b Derive the characteristic function of multivariate normal distribution.
- 9 a What is the distribution of T^2 statistic?
OR
b Define Mahalanobis D^2 statistic and write its distribution.
- 10 a Explain the terms canonical variables and canonical correlation.
OR
b What do you mean by classification problem?

Cont...

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 x 6 = 30)

- 11 a If X and Y are independent exponential variables with parameter 1, find the distribution of $X-Y$.
- OR
- b Explain the methods of finding the distribution of sum, product, difference and ratio of two independent random variables.
- 12 a If X follows exponential distribution with parameter θ , find the distribution of r th order statistic.
- OR
- b Derive the distribution of sample correlation coefficient when population correlation coefficient is 0.
- 13 a Prove that the conditional distribution of Multivariate Normal distribution is also normal.
- OR
- b If X is a p -component column vector and $X \sim MVN(\mu, \Sigma)$ then derive the distribution of $Y=cX$.
- 14 a Derive the relationship between T^2 and D^2 .
- OR
- b Describe any three application of T^2 .
- 15 a Write the discriminant function and derive its distribution.
- OR
- b Explain the procedure of obtaining canonical variables.

Z-Z-Z

END