MA5165 Statistical Methods for Engineers

Important 2 Mark Questions

Unit I

1. Define and distinguish between estimator and estimate.
2. How efficiency is identified in the criteria of estimation?
3. Let $X_1, X_2, \ldots, X_n$ be a sample from an exponential distribution with unknown parameter λ. Find the moment estimator of λ.
4. Let $X_1, X_2, \ldots, X_n$ be a random sample of size 'n' from a normal population $N(\mu, 1)$. Show that $T_n = \frac{1}{n}\sum_{i=1}^{n} X_i$ is an unbiased estimator of μ.
5. Give some good estimators.
6. What is the principle of method of moments?
7. Define the unbiased of an estimator.
8. What is meant by maximum likelihood estimator?
9. Give the characteristics of estimators.
10. Give the principle of method of moments.

Unit II

1. Define: (a) Type - I error (b) Type – II error.
2. If n = 100, $\bar{x} = 718, \sigma = 8.9$, test the null hypothesis $H_0: \mu = 70$ versus the alternative hypothesis $H_1: \mu > 70$ at the $\alpha = 0.05$ level of significance.
3. Define critical region.
4. What are the expected frequencies of 2×2 contingency table given below?

a	b
c	d

5. State any two applications of Chi square distribution.
6. Explain Null hypothesis and alternative hypothesis.
7. What are the two types of errors in testing of hypothesis? Define them.
8. What are the assumptions underlying the t-test?
9. Two sets of 100 students each were taught to read by two different methods. After the instructions were over, a reading test given to them reveal: $\overline{x_1} = 73.4, \overline{x_2} = 70.3, s_1 = 8$ and $s_2 = 10$. Compute the test statistic.
10. Why is the F-distribution associated with two numbers of degrees of freedom?

Unit III

1. Write the normal equations for the parabolic trend equation $Y = a + bX + cX^2$.
2. If $R_{1.23} = 0$, then find the value of $r_{12.}$
3. Give the difference between linear correlation and multiple correlation.
4. Give the normal equations for fitting a second degree parabola by the method of least squares.
5. Two variables X and Y have the regression lines $3X + 2Y = 26$ and $6X + Y = 31$. Find the mean values of X and Y.
6. Define partial correlation with an example.
7. What are the properties of regression coefficient?
8. Prove that a multicorrelation coefficient can never be negative.
9. In a trivariate distribution $r_{12} = 0.7, r_{23} = r_{31} = 0.5$, find $R_{1.23.}$
10. Give $R_{1.234} = 0.78, R_{1.23} = 0.74$ and $r_{12} = -0.5$. compute $r_{13.2}$ and $r_{14.23}$ taking negative signs.

Unit IV

1. The data yield the following analysis of variance table:

Source	Degree of freedom	Sum of square	Mean square	F
Treatment	2	390	–	–
Error	–	–	–	
Total	14	666		

   Complete the ANOVA table.
2. Why is a 2×2 Latin square not possible? Justify the claim.
3. What are the basic principles of design of experiment?
4. Write down the format of AVOVA table for one factor of classification.
5. State any two comparisons between RBD and LSD.
6. Write down the linear model of analysis of variance of one way classification.
7. Define factor and level in factorial design with an example.
8. What is the aim of design of experiments?

Unit V

1. Define Principle component.
2. Define First principle component.
3. The covariance matrix of two random variables X_1 and X_2 is given by $\Sigma \begin{bmatrix} 4 & 1 \\ 1 & 9 \end{bmatrix}$. Then find the standard deviation matrix.
4. If $X = \begin{bmatrix} 42 & 4 \\ 52 & 5 \\ 48 & 4 \end{bmatrix}$, find $\bar{X}$.
5. State the two properties of multivariate normal distribution.
6. Give an example of a tri-variate data in engineering applications.
7. Give an example of a covariance matrix and identify the variances in it.
8. Define random vector.