Descriptive Statistics-II (BST-201)

Short Question

1. Define Correlation.
2. Explain the concept of regression.
3. Give the interpretation of Correlation coefficient.
4. State any two properties of multiple correlation coefficients.
5. Concept of dependent and independent variables.
6. Define bivariate data.
7. Define Correlation.
8. Define covariance.
9. Give the interpretation of Correlation coefficient.
10. State any two properties of multiple correlation coefficients.
11. Concept of dependent and independent variables.
12. Define bivariate data.

Long Question

1. Derive the formula for Spearman's formula for Rank Correlation Coefficient without tie (in case of no tie).
2. Find the equation of regression plane of X_1 on X_2 and X_3.
3. Explain Coefficient of determination and its use in regression analysis
4. Write a short note on Scatter Diagram method of studying correlation.
5. State and Prove properties of regression coefficient.
6. Show that $b_{12.3} = \frac{b_{12} - b_{13}b_{23}}{1 - b_{23}b_{32}}$
7. Give the difference between correlation and regression.
8. Derive an expression for acute angle between the regression lines.
9. What is regression? Derive the equation of line of regression Y on X, by method of least square estimator.

10. Define residual $X_{1.23}$ and obtain its variance
11. Define multiple correlation coefficients ($R_{1.23}$). Obtain an expression for $R_{1.23}$ in terms of simple correlation coefficient.
12. Define the residual of variable X_2 w.r.t. X_1 and X_2. Obtain its variance in terms of simple correlation coefficient.
13. Explain the various types of correlation with real life example.
14. Prove that $X_{1.23}$ is uncorrelated with X_2 and X_3.
15. Define partial correlation coefficient.
16. Test the effect of Effect of change of origin and scale on regression coefficients.
17. Show that $V(X_1) \geq V(X_{1.2}) \geq V(X_{1.23})$.
18. Show that "if one of the regression coefficients is greater than one then the other must be less than one.
19. Show that $\sum X_{1.23}\, X_{1.23} = \sum X_{1.2}\, X_{1.23} = \sum X_1\, X_{1.23}$.
20. Show that partial correlation coefficient lies between -1 and +1.
21. Prove that $X_{1.23}$ is uncorrelated with X_2 and X_3.
22. Define scatter diagram. Also discuss its type.
23. Discuss the difference between Karl Pearson's correlation coefficient and Spearmen's correlation coefficient.
24. Give the use of coefficient of multiple determinations for selecting variables.
25. Discuss the difference between the correlation and regression

BST-202 Question Bank

Define following Term/Answer in one sentence. [2 Marks]

1) Define Hyper geometric distribution.
2) Write mean and variance of Bernoulli distribution.
3) Describe Bivariate discrete random variable.
4) Define joint probability mass function of (X,Y)
5) Define conditional expectation of bivariate random variable.
6) State recurrence relation for successive probabilities of Binomial distribution.
7) Define geometric distribution.
8) Describe distribution function of bivariate discrete random variable.
9) Write conditional distribution of X given Y.
10) Define binomial distribution.
11) Define Geometric distribution.
12) Define Poisson distribution.
13) Write mean and variance of discrete uniform distribution.
14) State additive property of Poisson distribution.
15) Define conditional expectation of bivariate random variable.
16) Define Bernoulli distribution giving an example.
17) Write conditional distribution of Y given X
18) Define Conditional Expectation of bivariate random variable.
19) Define Conditional Variance of bivariate random variable.
20) Define One point distribution giving an example.
21) Define Two point distribution giving an example.
22) What do you mean by a Bernoulli trial give an illustration of each.

Answer the following questions. [10Mark]

1. Obtain probability generating function of Poisson distribution. Find its mean.
2. The joint probability distribution of (X,Y) is given by;

$$P(x,y) = c(2x+3y) \quad ; x = 0,1,2 \quad \& \quad y = 1,2,3$$
$$= 0 \quad ; \text{ otherwise}$$

(i) Find c (ii) Marginal distributions of X and Y,

(iii) Conditional distribution of X given Y=2

(iv) Are X and Y independent random variables?

3. Define Geometric distribution and find its mean and variance.
4. Obtain probability generating function of Geometric distribution. Obtain it's mean and variance.

5. The joint probability distribution of (X,Y) is given by;

$$P(x,y) = c(2x+3y) \quad ; x = 0,1,2 \quad \& \quad y = 1,2,3$$
$$= 0 \quad ; \text{otherwise}$$

(i) Find c (ii) Marginal distributions of X and Y

(iii) Conditional distribution of X given Y=2

(iv) Are X and Y independent random variables?

6. Define Binomial distribution. Obtain its mean and variance.
7. Define: Bivariate discrete random variable, Joint probability mass function, Marginal probability mass function and Independence of random variable.
8. Define Poisson distribution. Obtain its mean and variance.
9. Consider the following joint probability distribution;

X \ Y	-1	0	1
-1	1/8	1/8	1/8
0	1/8	0	1/8
1	1/8	1/8	1/8

i) Find E(X) and E(Y)

ii) Find E(XY) and E(X+Y)

ii) Are X and Y independent?

10. Prove that hyper geometric distribution tends to binomial distribution as $N \to \infty$.
11. Define expectation of a function of bivariate discrete random variable. State and prove addition theorem of expectation.
12. Define Independence , correlation coefficient. Show that independence implies uncorrelation. Dose the converse true? Justify.
13. Define conditional mean, conditional variance, Independence of random variables X and Y. Prove that, the random variable X and Y Independent iff P(Xi / Yi) = p(xi) for all i, j

14. Obtain the p.g.f. of Bernoulli distribution. Hence find its mean variance.
15. Let X be a binomial random variable with parameter n and p prove that the distribution of Y= n- X is binomial with parameter n and q.

Answer the following questions. [5 Mark]

1) State and prove additive property of Poisson distribution.
2) Define covariance. Find Cov(aX+bY, cX+dY).
3) State and prove additive property of binomial distribution.
4) Define cumulative distribution function of a bivariate discrete random variable and state its important properties.
5) Define: Discrete uniform distribution. Obtain its variance. a
6) Define mathematical expectation of bivariate discrete random variable and Prove that E(XY) = E(X) E(Y) when X and Y are independent.
7) Define: Bivariate discrete random variable and Joint probability mass function.
8) Define covariance. Find Cov(aX+bY, cX+dY).
9) State and prove additive property of Poisson distribution.
10) Define Mathematical expectation of a function of bivariate discrete random variable. Prove that E(XY) = E(X) E(Y) when X and Y are independent.
11) Find the recurrence relation between the probabilities of Negative binomial distribution.
12) Define: Discrete uniform distribution. Obtain its variance.
13) State and prove lack of memory property of a geometric distribution.
14) Define covariance. Find Cov(aX+bY, cX+dY).
15) State and prove additive property of Binomial distribution.
16) Define Conditional probability mass function of X given Y and Y given X.
17) Find the mean and variance of Bernoulli distribution.
18) Find the recurrence relation between the probabilities of Hypergeometric distribution.
19) Derive p.m.f. of binomial distribution.
20) Obtain the p.g.f of Binomial and hence obtain its mean and variance.
21) Suppose X_1, X_2,…..X_n are n Bernoulli variates each with parameter p. Show that Z= X_1+ X_2+…..+ X_n is a binomial variate with parameter n and p.

22) With usual notation prove that, $V(aX + bY) = a^2V(X) + b^2V(Y) + ab \operatorname{cov}(X, Y)$.

23) Define expectation of a function of bivariate discrete random variable. State and prove addition theorem of expectation.

24) Define expectation of a function of bivariate discrete random variable. State and prove Multiplication theorem of expectation.

25) Define Correlation Coefficient of bivariate random variable . Find $Cov(X+ a, Y+ b)$.