29-11-14

[This question paper contains 6 printed pages.]

Sr. No. of Question Paper : **1144** **Roll No.**.....(M)

Unique Paper Code : **248102**

Name of the Course : **B.A. (Hons) Business Economics, 2014**

Name of the Paper : **Statistics for Business Economics**

Semester : **I**

Duration : **3 Hours**

Maximum Marks : **75**

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **all** questions.
3. Choice is available within each question.
4. Use of simple calculator is allowed.
5. Begin each question from a new page.

1. Attempt any **two** parts. (5 x 2)

(a) The noise level experienced by 150 employees in a production unit has the following distribution

Noise level (dBA)	No. of employees
50-60	30
60-65	30
65-67.5	25
67.5-70	20
70-75	20
75-85	25

P.T.O.

(i) Sketch the histogram to depict the data.

(ii) Without calculating the mean and median, state which is greater and why.

(iii) What proportion of employees experience a noise level less than 67?

(b) An investment analyst suggests that you invest in ABC Ltd. instead of XYZ Ltd. Given the annual rates of return shown below for a sample of each investment, what would your decision be if

(i) you wish to earn maximum mean return

(ii) minimise your risk exposure

ABC Ltd. (Returns in percent)	XYZ Ltd. (Returns in percent)
15.5 %	4%
21.7%	5.5%
-7.8%	3.5%
-5.0%	4.1%
3.6%	6.2%
27.2%	7.2%
2.2%	4.2%
12.2%	----

(c) A distribution is known to have a mean of 40 and a standard deviation of 5. The distribution is mesokurtic and symmetric. Calculate the first four moments of the distribution about the origin.

2. Attempt any **three** parts.

(a) State the normal equations of the line of regression of Y on X.Use these equations to prove that

(i) the $\sum e_i = 0$, and

(ii) that covariance (X,e) =0 where $e_i = Y_i - \hat{Y}_i$

(b) A regression was conducted on 20 pairs of observations to examine the relation between volume of runoff water (Y in litres) and the amount of rainfall (X in mm) The regression equation is $Y = -1.128 + 0.8269\,X$ and $R^2 = 0.975$ and Standard Error of the regression is 5.24.

(i) What are the units of -1.128 and of 0.8269?

(ii) What proportion of variation in Y is explained by X?

(iii) What does the standard error of regression measure ?

(c) A bivariate data of 10 pairs of values of X and Y provides the following results:

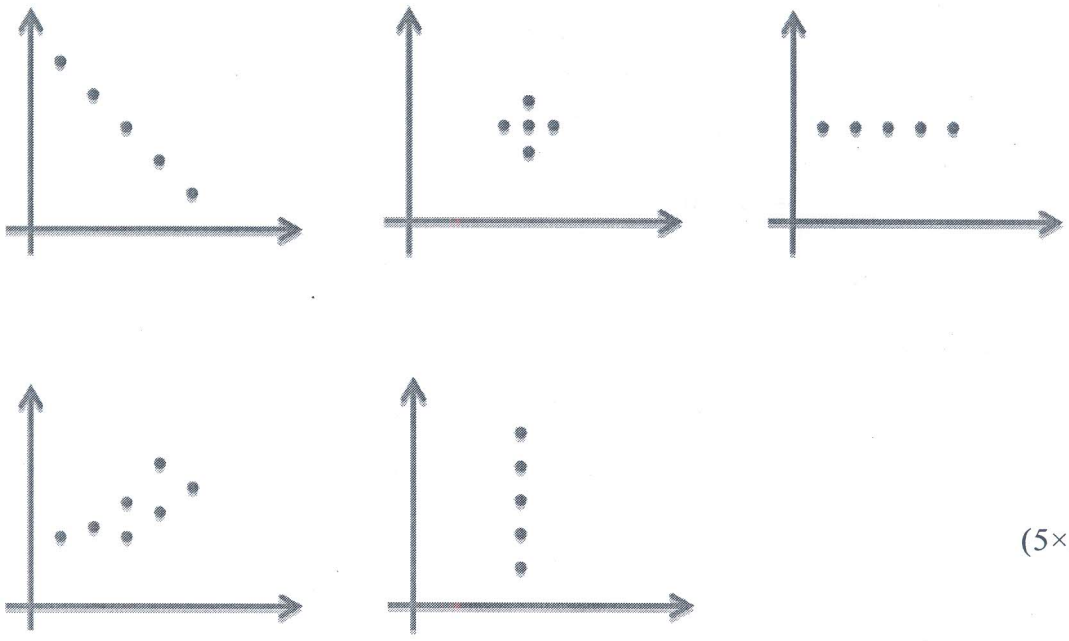
$\sum X_i = 38$, $\sum Y_i = 54$, $\sum X_i^2 = 166$, $\sum Y_i^2 = 358$, and $\sum X_i Y_i = 235$

(i) Calculate the coefficients for the regression of Y on X

(ii) Calculate the coefficient of correlation.

(iii) If the values of X are multiplied by 2 and 5 is added to each value of Y, what is the new value for thecoefficient of correlation.

(d) For each of the scatter plots provided below, state the value (or range of values) of the coefficient of correlation and of the slope coefficient of the regression of Y on X.



(5×3)

3. Attempt any **five** parts.

(a) If $P(B) = \frac{1}{2}$, $P(A \cap B) = \frac{1}{4}$ and $P(C \mid A \cap B) = \frac{1}{2}$. Find $P(A \cap B \cap C)$.

(b) It is known that one in every thousand persons in a town suffer from tuberculosis (T.B). A test for diagnosis has the following properties. If a person does not suffer from TB, the test indicates it with a probability of 0.999. If a person does not suffer from T.B then there is a probability of 0.002 that the test wrongly shows that a person suffers from T.B. For a randomly selected person, if the test shows positive for T.B., what is the probability that the person does really suffer?

(c) A probability density function is given by:

$$\frac{1}{2} f(x) = \begin{cases} -k(x-3)^2 & , \quad 0 < x < 6 \\ 0 & , \quad \textit{elsewhere} \end{cases}$$

(i) Find the value of k for f(x) to be a valid probability density function.

(ii) Use the value of k calculated above to find cumulative distribution function for variable X.

(d) A joint probability mass function for discreet variable X and Y is as follows

X ↓ \ Y →	10	20	30
5	0.1	0.05	0
6	0.15	0.25	0.05
7	0.05	0.2	0.15

Calculate

(i) E(X)

(ii) Variance of Y

(iii) Conditional distribution of X given $Y \geq 20$.

(e) If it is known that a shooting probability of scoring a hit on the target is 0.4

(i) What is the probability that a shooter scores 2,3 or 4 hits in 5 attempts?

(ii) What is the probability that the shooter scores atmost 4 hits when it is known that the shooter scores atleast 2 hits?

(f) The weight of bricks produced at a kiln are normally distributed with mean weight 1548 gms and standard deviation of 80 gms.

(i) What is the probability that a brick chosen at random has weight greater than 1700 gms?

(ii) What is the maximum weight of the lightest 20% bricks? (5×5)

4. Attempt any **three** parts.

(a) Define the properties of unbiasedness and efficiency for estimators. Use the above properties to comment upon the three estimators

$$A = \frac{X_1 + X_2 + X_3}{3}, \quad B = \frac{X_1 + 2X_2 + 3X_3}{6}, \quad C = \frac{2X_1 + X_2 + 4X_3}{6}$$

for estimating the population mean .

(b) A sample of 16 observations of daily consumption expenditures by a family provided a mean of Rs. 260 and a sample standard deviation of Rs. 25 . Is it possible to conclude that the average daily expenditure of the family is below 250? Test at 5% and 1% level of significance.

(c) A producer wishes to test the diameter of bearings produced by the machine. If the variance in diameter is 1.69mm. What minimum size of sample should be used so that the estimate is precise upto $\pm$ 0.2mm and the level of confidence required is 99%.

(d) DefineType I error. For a population with standard deviation 20, a sample of size 100 is taken to test the null hypothesis $H_0 : \mu = 435$. If the statistician decides to reject the null hypothesis H_0 if $\overline{X} > 437$ and accept H_0 if $\overline{X} < 437$. Compute the probability of Type I error. (5×3)

5. Attempt any **two** parts.

(a) From the data provided below, calculate the Paasche price index for the period 2010 to 2013 with 2010 as base.

Year	Commodity X		Commodity Y	
	Price	Quantity	Price	Quantity
2010	2	20	10	5
2011	2	25	12	8
2012	3	30	15	10
2013	4	30	15	15

(b) The prices of a certain commodity increased by 20% from the year 2005 to 2006. The price index in 2007 with 2006 as base was 130. The price index in 2008 with 2005 as base was 180. Calculate the price index series from 2005 to 2008 as 2006 as base.

(c) A consumer price index is based on five groups of commodities: food, clothing, health, communication, and housing. The groups have weights specified as 0.4, 0.2, 0.1, 0.1 and 0.2 respectively. If the consumer price index is 127 in 2011 with base in 2010 and the indices for the first four commodity groups are 120, 135, 140, 130 for the same period, what is the price index of housing in 2011 with base in 2010. (5×2)

(500)