[This question paper contains 11 printed pages.]

Your Roll No..............

Sr. No. of Question Paper : 2084

Unique Paper Code : 12481302

Name of the Paper : Statistics for Business Economics

Name of the Course : **B.A. (Hons) Business Economics, 2018 (CBCS)**

Semester : III

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. Use of simple calculator is allowed. Required statistical tables are attached with this paper.

1. Attempt any three from the parts (a) to (d) in this question. (5×3)

   (a) (i) Calculate the coefficient of variation of the first n natural numbers.

P.T.O.

(ii) How will this coefficient of variation change if the numbers are the first n even numbers?

(b) The time taken (in minutes) by 8 athletes to finish a marathon was recorded as

160, 220, 250, 150, 200, 300, 320, 400.

(i) Calculate 20% trimmed mean.

(ii) What is the median for the data? How does the median change if the observation 160 is changed to 200.

(c) The median and standard deviation of a distribution that is symmetrical and mesokurtic is 20 and 3 respectively. Find the first four moments about zero.

(d) If the coefficient of correlation (r) between two variables X and Y is 0.8, what will be the value of r between

(i) 2X and Y

(ii) –X and Y.

(iii) Does a value of r equal to zero imply the lack of a relationship between the two variables? Explain.

2. Attempt any five from the parts (a) to (f) in this question. (5×5)

(a) If A and B are mutually exclusive events where $P(A) = 0.26$ and $P(B) = 0.45$, find

(i) $P(\bar{A})$

(ii) $P(A \cup B)$

(iii) $P(A \cap \bar{B})$

(iv) $P(\bar{A} \cap \bar{B})$

(b) The probability mass function p(x) of the random variable X is given by:

x	13.5	15.9	19.1
$p(x)$	0.2	0.5	0.3

Find the expected value and the variance of $Y = 25X - 8$.

(c) A set of examination marks is normally distributed with mean of 75 and standard deviation of 5. If top 5% of the students get grade A and bottom 25% get grade F, what mark is the lowest A and what mark is highest F?

P.T.O.

(d) X is a continuous random variable with probability density function

$$f(x) = \begin{cases} \frac{x}{6} + k & 0 \le x \le 3 \\ 0 & otherwise \end{cases}$$

(i) Find the value of k

(ii) Find $P(1 < X < 2)$ and $P(X > 2)$

(e) Consider the following joint probability mass function of X and Y

p(x,y)	*Y*		
X	**5**	**10**	**15**
1	1/9	1/9	0
2	1/6	2/9	1/6
3	0	0	2/9

(i) Are X and Y independent?

(ii) Find $P(X + Y > 12)$.

(iii) Find the conditional probability distribution $P(X|y < 15)$.

(f) The cumulative distribution function for a continuous random variable X is

$$F(x)=\begin{cases} 0 \ , & x<1 \\ x^2/4 \ , & 1\le x<2 \\ 1 \ , & x\ge 2 \end{cases}$$

Find

(i) $P(0.5 \le x \le 1)$ and $P(X > 1.5)$.

P14 0.4371

(ii) Determine probability density function of x.

(iii) Calculate median value of x.

3. Attempt any **five** from the parts (a) to (f) in this question. (5×5)

(a) (i) State the Central Limit Theorem.

(ii) X is a random variable with mean 4 and standard variation of 1.5. If a sample of size 50 is independently prepared, what is the probability that sample mean lies between 3.5 and 3.8? How is the Central Limit Theorem applicable in this case? 0.1645

P.T.O.

(b) There are two traffic lights on a commuter's route to and from work. Let X_1 be the number of lights at which the commuter must stop on his way to work, and X_2 be the number of lights at which he must stop when returning from work. Suppose these two variables are independent, each with pmf given in the accompanying table (so x_1, x_2 is a random sample of size $n = 2$).

x	0	1	2
$P(x)$	0.2	0.5	0.3

$\mu = 1.1, \sigma^2 = 0.49$

(i) Determine the pmf of $T_0 = X_1 + X_2$.

(ii) Calculate μ_{T_0}. 2.2

(c) As part of an investigation to determine the efficacy of a drug treatment protocol, a researcher has determined the mean of a particular random variable as 125. She accumulates a sample of 15 with mean of 130 and standard deviation of 12. Is there enough evidence to prove that mean is greater than the anticipated level of 125.

(d) Assume that the helium porosity (in percentage) of coal samples taken from any particular seam is normally distributed with true standard deviation .75.

(i) Compute a 98% CI for the true average porosity of a certain seam if the average porosity for 20 specimens from the seam was 4.85.

(ii) How large a sample size is necessary if the width of the 95% interval is to be .40?

(e) Two production processes are used to produce steel pipes. A sample of 100 pipes is taken from the first production process and has a mean length of 27.3 inches and a standard deviation of 10.3 inches. The corresponding figures for 100 pipes produced by the second method are 30.1 and 5.2 respectively. Is there a significant difference in mean length of pipes produced by the two methods at 1% level of significance.

(f) (i) Define Type I and Type II errors. Explain using a diagram, how changes in the rejection and acceptance criterion can reduce one error at the cost of increasing the other.

4. Attempt any **two** from the parts (a) to (c) in this question. (2×5)

(a) Prove or explain why the Laspeyres price index is greater than the Paasche price index.

(b) (i) The consumer price index over a certain period increased from 120 to 215 and wages of a worker increased from Rs. 1680 to Rs. 3000. What is the gain or loss to the worker?

(ii) Explain the time reversal and the factor reversal tests of index numbers. Which index number satisfies both the tests?

(c) An index has a value of 100 in 2011. It rises by 4% in 2012, falls by 6% in 2013, falls again by 4% in 2014 and rises by 3% in 2015. Construct the index number series for the five years with 2013 as the base.