BRAINWARE UNIVERSITY

Term End Examination 2022
Programme – MBA(HM)-2022
Course Name – Biostatistics
Course Code - MBAHM106
(Semester I)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) The geometric mean of: 1, 2, 3 lies between

a) 1 and 1,5 b) 1.5 and 2
c) 2 and 2.5 d) 2.5 and 3

(ii) If two random variables are independent then the correlation coefficient of these two random variables is

a) - 1 b) 0
c) 1 d) cannot be said.

(iii) The 25% percentile value of the numbers: 10, 9, 11, 8, 7, 11, 6 is

a) 6 b) 7
c) 8 d) 9

(iv) Of the below, which is a qualitative variable?

a) Annual income of individuals in a population b) Gender of individuals in a population
c) Age of individuals in a population d) Blood pressure of individuals in a population

(v) Variance of some numbers is 100. Average of the numbers is 10. Then the average of the squares of the numbers is

a) 0 b) 100
c) 200 d) Cannot be determined

(vi) Of the below, which is a quantitative variable?

a) Eye colour of individuals b) Gender of individuals
c) Whether an individual has diabetes or not d) Weight of individuals

(vii) The probability of a normally-distributed random variable that it takes value more than average + standard deviation is

a) about 0.25 b) about 0.20
c) about 0.16 d) about 0.1

(viii) For a standard normal variate, the value of mean is? Infer

a) 0 b) 1
c) 10 d) Infinite

(ix) Two bar charts, one showing the frequencies of the categories and another showing the relative frequencies will

a) look similar, bars having the heights in the same proportions b) be different altogether
c) be exactly the same d) none of these

(x) Average (arithmetic average) of some numbers must lie

a) between the minimum and maximum of the numbers b) between the median and maximum of the numbers
c) between the minimum and median of the numbers d) between the mode and maximum of the numbers

(xi) The area under a standard normal curve is? Infer

a) 0 b) 1
c) 2 d) 3

(xii) In a data for regressing Y with X (independent variable), average of Y is 10.0 and average of X is 2.0. The estimate of the slope of the straight line is 3.0. Then the estimate of the intercept of the line is

a) 2.0 b) 3.0
c) 4.0 d) cannot be determined

(xiii) Find the variance of the numbers, 1, 2, 3, 4, 5.

a) 1 b) 1.5
c) 2 d) 2.5

(xiv) The relationship between mean & median is

a) mean â‰¤ median b) mean â‰¥ median
c) mean = median d) none of these

(xv) What is not true about a population?

a) It is the entire collection of individuals or objects about which we are interested. b) It has variables, which vary from one individual/ object, to another.
c) It has some parameters of interest. d) It has to contain a large number of individuals/ objects.

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Find the covariance of the random variables X & Y, when the probabilities of different values are given in the following table. X 1 2 3 Y 0 0.1 0.2 0.1 1 0.3 0.1 0.2 2 (3)
3. Compute the sample correlation coefficient for the following sampled values, collected randomly. X Y 5 4 3 2 4 3 6 5 3 3 (3)
4. Find the mean, median, mode of the data 4, 3, 3, 5, 6. 9. 10, 3, 5, 10 (3)
5. A firm has 550 employees, 380 of them have had some college education, and 412 of the employees underwent a vocational training program. Furthermore, 357 employees both are college educated and have had the vocational training. If an employee is chosen at random, what is the probability that he or she is college educated or has had the training or both? (3)
6. Average soap consumption in a certain country is believed to be 2.5 bars per person per month. The standard deviation of the population is known to be 0.8. While the standard deviation is believed to has not changed, the mean consumption may have changed either upward or downward. A survey is therefore undertaken to test the null hypothesis that average soap consumption is still 2.5 bars per person per month versus the alternative that it is not. A random sample of size of n = 20 is collected and gives a sample average of 2.3. The population is normally distributed. What is the appropriate test statistic in this case? Conduct the test and state your conclusion. Use Î± = 0.05. (For standard normal distribution, P(Z > 1.96) = 0.025.) (3)

OR

At a steel plant, statistical quality control methods have been used very successfully in controlling slab width on continuous casting units. The company claims that a large reduction in the steel slab width variance resulted from the use of these methods. Suppose that, the variance of steel slab width is desired to be 156 (squared units). A test is carried out to determine whether the variance is above the desired level, with the intention to take corrective action if it is concluded that the variance is greater than 156. A random sample of 25 slabs gives sample variance of 175. Use Î± = 0,05. Should corrective action be taken? Assume slab width follows a normal distribution, (For chi-square distribution with 24 degrees of freedom, P(Chi-square Variate > 36.4151) = 0.05.) (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Three machines A, B and C are used to produce the same part, and their outputs are collected in a single bin. Machine A produced 26% of the parts in the bin, machine B 38% and machine C the rest. Of the parts produced by Machine A, 8% are defective. Similarly, 5% of the parts from B and 4% from C are defective. A part is picked at random from the bin. If the part is defective, what is the conditional probability it was produced by Machine A? (5)
8. The mean and S.D. of a sample size 10 were found to be 9.5 and 2.5 respectively later on an additional observation became available. It was 15 and was included with the original sample. Examine the mean and S.D. of the 11 observation. (5)
9. A random variable X has mean 10.0 and standard deviation 2.0. Random variable Y = 2 X + 5. What is the mean and standard deviation of Y? What is the correlation coefficient of X and Y? (5)
10. A restaurant has three sources of revenue: eat-in orders, take-out orders and the bar. The daily revenue from each source is normally distributed with mean and standard deviation as shown in the table, These are also independent random variables. Mean Standard Deviation Eat-in 5780 142 Take-out 641 78 Bar 712 72 (a) Will the total revenue on a day be normally distributed? (b) What is the mean and standard deviation of the total revenue on a day? (c) What is the probability that the revenue will exceed 7000 on a particular day? (For a standard normal distribution, P(Z > 0.7502) = 0.2266.) (5)
11. Construct two sets of observations such that these have the same mean and median but the standard deviations are different. (5)
12. A module in a spacecraft is made of 5 components. The weights of these components are independent normally-distributed random variables with average weight and standard deviation of weight as given in the succeeding. Average (kg) Standard Deviation (kg) Component 1 50 5 Component 2 60 6 Component 3 40 5 Component 4 50 6 Component 5 70 6 What is the probability that the module will have weight less than 280 kg? (For standard normal distribution P(Z < 0.7955) = 0.7865) (5)

OR

Calculate the correlation coefficient for the following data. X Y 0 2 1 1 2 3 3 4 4 5 (5)

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