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08 CHARTERED ACCOUNTANTS OF SRI LANKA

SCHOOL OF ACCOUNTING AND BUSINESS BSc. (APPLIED ACCOUNTING) GENERAL / SPECIAL DEGREE PROGRAMME

# YEAR I SEMESTER II (INTAKE VI - GROUP A) END SEMESTER EXAMINATION - JANUARY 2017 

## QMT 10230 Business Statistics

| Date | $:$ | $20^{\text {th }}$ January 2017 |
| :--- | :--- | :--- |
| Time | $:$ | 9.00 a.m. -12.00 p.m. |
| Duration | $:$ | Three $(03)$ hours |

## Instructions to Candidates:

- Write the Index Number in the space provided at the top of this sheet. Do not write your name anywhere in this question paper.
- Answer only FIVE (05) questions including Question No. 01
- Question No. 01 - Answer ALL questions in the paper itself and attach it to the answer script.
- All questions carry equal marks.
- The total marks for the paper is 100 .
- Use of scientific calculator is allowed.
- Formula sheet is provided
- Standard Normal Z-table and Key Statistical Formulas are provided.
- Graph Sheets are provided on request.


## Question No. 01

Multiple Choice Questions; Choose the one alternative that best completes the statement or answers the question.
i. Inferential statistics guides us,
a. how to select a sample from a population
b. how to organize, display and present data
c. how to make decisions about population based on sample results
d. how to make decisions about mean, median, or mode
e. none of the above
(........)
ii. The Weight of a student is 75 Kgs . This is an example of ....
a. qualitative data
b. discrete data
c. ordinal data
d. continuous data
e. categorical data
(........)
iii. The measure of central tendency which is the most likely to be influenced by extreme values/outliers in the data set is the
a. mode
b. range
c. variance
d. mean
e. median
iv. Which of the following is not based on all the observations?
a. Harmonic mean
b. Arithmetic mean
c. Weighted mean
d. Geometric mean
e. Mode
(........)
v. When preparing a frequency distribution, the lower limit of the first class internal should always be:
a. a number that is less than or equal to the smallest value in the data set
b. a number that is greater than the smallest value in the data set
c. equal to 10
d. equal to zero
e. none of the above
(........)
vi. If two events are independent, then
a. The sum of their probabilities must be less than one
b. Their intersection must be zero
c. They must be mutually exclusive
d. The sum of their probabilities must be equal to one
e. None of these alternatives is correct.
(........)
vii. A Garment manufacturer is interested in the number of defects occurring in each 100 feet of material. The probability distribution that has the greatest chance of applying to this situation is the,
a. Normal distribution
b. Binomial distribution
c. Poisson distribution
d. Uniform distribution
e. Bernoulli distribution
(........)
viii. Which of the following is not a property of a binomial experiment?
a. the trials are independent
b. each outcome can be referred to as a success or a failure
c. the experiment consists of a sequence of $\mathbf{n}$ identical trials
d. the probabilities of the two outcomes can change from one trial to the next
e. none of the above
$\qquad$
ix. Which of these is a relative measure of dispersion
a. Standard Deviation
b. Variance
c. Coefficient of determination
d. Coefficient of variation
e. None of these
(........)
x. If arithmetic mean is multiplied by the coefficient of variation then resulting value is classified as,
a. Coefficient of determination
b. Standard deviation
c. Coefficient of deviation
d. Variance
e. Combined mean
(........)
xi. The mean marks of 100 students for Statistics is 58 and the variance of the marks is 49 . Which is the value of the coefficient of variance.
a. $84.48 \%$
b. 8 times
c. $2 / 3$
d. $21.55 \%$
e. $12.07 \%$
xii. In the case of heterogeneous population between groups, which of the following sampling method is the proper and effective method for selecting representative sample of the target population.
a. Cluster sampling method,
b. Quota sampling method,
c. Judgment sampling method,
d. Stratified sampling method,
e. Convenience sampling method,
xiii. Which of the following is true for a positively skewed distribution?
a. $\quad$ Mode $=$ Mean $=$ Median
b. Mode < Median < Mean
c. Median < Mode > Mean
d. Mean < Median < Mode
e. Mean > Median < Mode
(........)
xiv. Probability distribution having shape of a bell and in which values of mean, median and mode lie in center of probability distribution is classified as,
a. Uniform Distribution
b. Hyper Geometric Distribution
c. Continuous Distribution
d. Normal Distribution
e. Discrete Distribution
(........)
xv. Which of the following interpretation is explained about the coefficient of determination $\left(\mathbf{R}^{2}\right)$.
a. Proportion of mean variation
b. Proportion of points on the line
c. Proportion of explained variation
d. Proportion of unexplained variation
e. Proportion of mean deviation,
xvi. A $\qquad$ is formed by selecting one unit at random and then selecting additional units at evenly spaced intervals until the sample has been formed.
a. Stratified random sample
b. Judgment sample
c. Systematic random sample
d. Simple random sample
e. none of the above
$\qquad$
xvii. A summary measure that describes any given characteristic of the population is known as a $\qquad$
a. information
b. statistic
c. inference
d. parameter
e. none of the above
xviii. When an investigator uses the data which has already been collected by others, such data is called ....
a. processed data
b. primary data
c. collected data
d. issued data
e. secondary data
(........)
xix. Which of the following is not a property of the standard deviation?.
a. It may have any positive or negative value
b. It is affected by extreme value in a data set
c. It is most widely used measure of spread
d. It uses all the observations in the data set in its computation
e. All the above statements are properties of standard deviation
$\qquad$
xx. Type of variable which can take any numerical value within upper and lower limit for calculation is classified as
a. Ordinal variable
b. Nominal variable
c. Qualitative variable
d. Continuous variable
e. Binary variable

## Question No. 02

Annual earnings of selected 145 service sector companies and 165 trading sector companies for the year 2016 are given below.

| Annual Earnings <br> (Rs. Mn) | Business Sector |  |
| :---: | :---: | :---: |
|  | Service | Trading |
| $0-09$ | 12 | 08 |
| $10-19$ | 15 | 10 |
| $20-29$ | 25 | 18 |
| $30-39$ | 35 | 30 |
| $40-49$ | 20 | 38 |
| $50-59$ | 16 | 27 |
| $60-69$ | 14 | 23 |
| $70-79$ | 08 | 11 |
| Total | $\mathbf{1 4 5}$ | $\mathbf{1 6 5}$ |

Using the above data compute the followings measures for manufacturing and trading sector for the year 2016 and compare your results between two sectors.
i. Compute arithmetic mean, median, and mode of each sector and compare your result.
ii. Compute standard deviation for each sector and compare your result.
iii. Compute the coefficient of variance for each sector and compare your result. (04 Marks)
iv. Compute combined mean profit and combined standard deviation of profit in two sectors taken together.

## Question No. 03

i. "Correlation and regression analysis can be used for various business and management decisions." Comment.
(04 Marks)
ii. The annual sales and research \& development expenditure (R\&D) of Gama Company Limited during last ten years are given below.

| Year | R\&D <br> Expenditure <br> (Rs'Mn) | Sales <br> (Rs'Mn) |
| :--- | :---: | :---: |
| 2007 | 30 | 65 |
| 2008 | 40 | 90 |
| 2009 | 50 | 125 |
| 2010 | 60 | 150 |
| 2011 | 70 | 200 |
| 2012 | 80 | 180 |
| 2013 | 90 | 220 |
| 2014 | 100 | 250 |
| 2015 | 110 | 240 |
| 2016 | 120 | 275 |

Using the above data, you are required to,
a. Draw a scatter diagram to show the nature of the relationship between the $R \& D$ expenditure and the sales.
b. Compute the relationship between the R\&D expenditure and the sales and interpret your result.
c. Fit the regression model to show the impact of R\&D expenditure on sales.
d. Estimate the sales when expected R\&D expenditure for year 2017 will be Rs. 115 Million.
e. Determine the coefficient of determination and interpret your result.
(Total 20 Marks)

## Question No. 04

i. "Random experiment and sample space are two basic probability concepts." Explain the meaning of two concepts using suitable examples.
(04 Marks)
ii. Person is throwing a dice. Let $A$ be the event "it will be receiving a number higher than four( 04 )," and let $B$ be the event "it will be receiving a number less than five( 05 )"
a. write sample space and possible outcomes of event A and event B
b. Find the $\mathrm{P}(\mathrm{A})$,
c. Find the $\mathrm{P}(\mathrm{B})$,
d. Find the $\mathrm{P}\left(\mathrm{A}^{\prime}\right)$,
e. Find the $P(A \cap B)$,
f. Find the P (AUB).
(08 Marks)
iii. What do you mean by conditional probability? Explain through an example.
(04 Marks)
iv. At coffee shop $75 \%$ of its customers wants snack to eat. $80 \%$ want to drink coffee. $50 \%$ want both. What is the probability of a customer who wants coffee also want snacks?
(04 Marks)
(Total 20 Marks)

## Question No. 05

i. Annual estimated return of Project-X and Project-Y under different possible economic conditions, along with the probability that each of these economic conditions will occur over the life time of the projects are given by the following table.

| Possible Conditions | Probability | Net Return/Loss |  |
| :--- | :---: | :---: | :---: |
|  |  | Project-X (Rs. Mn) | Project-Y (Rs. <br> Mn) |
| Extreme Recession | $\mathbf{0 . 1 1}$ | -21 | -30 |
| Recession | $\mathbf{0 . 1 9}$ | -07 | -12 |
| Stagnation | $\mathbf{0 . 3 4}$ | 25 | 40 |
| Growth | $\mathbf{0 . 2 1}$ | 42 | 50 |
| High growth | $\mathbf{0 . 1 4}$ | 55 | 75 |

Using the above details determine,
a. The expected annual return of each project
b. The standard deviation of annual return of each project.
c. Choose the best project to invest in terms of expected return, and,
d. Choose the best project to invest in terms of risk condition,
ii. What do you mean by sample distribution? Explain through an example.
iii. Consider the following conditions and explain how you select random sample in given situation
a. Finite population, where number of units in the population is known
b. Infinite population, where number of units in the population is unknown

## Question No. 06

i. What are the basic properties of Binomial, Poisson and Normal probability distributions? (06 Marks)
ii. XYZ Company has reported that there are only three product failures in last 100 days. Calculate the followings,
a. What is the probability of no failures in given day
b. One or more failures in a given day
(04 Marks)
iii. A client has an investment portfolio whose mean value is equal to Rs. 960000 with a standard deviation of Rs. 45 000. It is assumed that the investment portfolio of 450 clients is following normal distribution. He has asked you to,
a. determine the probability that the value of his portfolio is between Rs. 900000 and 1000 000,
b. determine the probability that the value of his portfolio is between Rs. 810000 and 930000 ,
c. determine the probability that the value of his portfolio is less than Rs. 810000 ,
d. determine the probability that the value of his portfolio is greater than Rs. 1020 000,
e. determine the probability that the value of his portfolio is between Rs. 1000000 and 1050000 ,

## Question No. 07

i. What are the assumptions involved in the use of regression analysis?
(04 Marks)
ii. Karl Pearson's correlation coefficient is used to test the relationship between selling prices of houses and its selected determinants using SPSS. Correlation results are given by the table below.

| Correlations |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Selling Price <br> (Rs.'000) | Area | House Size (Square Meters) | Age in Years | Land Size (Square Meters) |
| Selling Price(Rs.' 000 ) | Pearson Correlation | 1 | . $803{ }^{\text {n/ }}$ | . $921{ }^{\text {¹ }}$ | -. $913^{\text {nr }}$ | . $243^{*}$ |
|  | Sig. (2-tailed) |  | . 000 | . 000 | . 000 | . 029 |
|  | N | 81 | 81 | 81 | 81 | 81 |
| Area | Pearson Correlation | . $803{ }^{\text {"* }}$ | 1 | . $759{ }^{\text {"1 }}$ | -.790 ${ }^{\text {r }}$ | . $261{ }^{\text {²}}$ |
|  | Sig. (2-tailed) | . 000 |  | . 000 | . 000 | . 018 |
|  | N | 81 | 81 | 81 | 81 | 81 |
| House Size(Square Meters) | Pearson Correlation | $.921{ }^{\text {N* }}$ | . 759 " | 1 | $-.859^{\prime \prime}$ | . $236{ }^{\text {² }}$ |
|  | Sig. (2-tailed) | . 000 | . 000 |  | . 000 | . 034 |
|  | N | 81 | 81 | 81 | 81 | 81 |
| Age in Years | Pearson Correlation | -. $913^{\text {nn }}$ | -. $790{ }^{\text {¹ }}$ | -.859 ${ }^{\text {¹ }}$ | 1 | -. 173 |
|  | Sig. (2-tailed) | . 000 | . 000 | . 000 |  | . 122 |
|  | N | 81 | 81 | 81 | 81 | 81 |
| Land Size(Square Meters) | Pearson Correlation | . $243{ }^{\text {² }}$ | . $261{ }^{\text { }}$ | . $236{ }^{\text {²}}$ | -. 173 | 1 |
|  | Sig. (2-tailed) | . 029 | . 018 | . 034 | . 122 |  |
|  | N | 81 | 81 | 81 | 81 | 81 |

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
a. Construct number of hypotheses to test the relationship between dependent variable (selling prices of houses) and each independent variable (Determinants of Selling prices of houses),
b. Test each hypothesis using information in the above correlation metric and discuss the nature and the degree of relationship between the annual selling prices of houses and each of the above determinant.
(06 Marks)
iii. SPSS linear regression output which shows the selling price per house on various determinants of selling price of a house is given below.

Variables Entered/Removed ${ }^{\text {a }}$

| Model | Variables Entered | Variables <br> Removed | Method |
| :--- | :--- | :--- | :--- |
| 1 | Land Size(Square Meters), Age in <br> Years, Area, House Size(Square <br> Meters) |  | Enter |

a. Dependent Variable: Selling Price(Rs. ${ }^{\prime} 000$ )
b. All requested variables entered.

Model Summary

| Model | R | R Square | Adjusted <br> Square | Std. Error of the <br> Estimate |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 1 | $.954^{\mathrm{a}}$ | .910 | .905 | 6.613 |

a. Predictors: (Constant), Land Size(Square Meters), Age in Years, Area, House Size(Square Meters)

ANOVA ${ }^{a}$

| Model | Sum of <br> Squares | df | Mean Square | F | Sig. |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Regression | 33621.589 | 4 | 8405.397 | 192.190 | $.000^{\mathrm{b}}$ |
| Residual | 3323.843 | 76 | 43.735 |  |  |
| Total | 36945.432 | 80 |  |  |  |

a. Dependent Variable: Selling Price(Rs.'000)
b. Predictors: (Constant), Land Size(Square Meters), Age in Years, Area, House Size(Square Meters)

## Coefficients ${ }^{\text {a }}$

| Model |  | Unstandardized Coefficients |  | $\begin{gathered} \hline \begin{array}{c} \text { Standardized } \\ \text { Coefficients } \end{array} \\ \hline \text { Beta } \\ \hline \end{gathered}$ | t | Sig. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | B | Std. Error |  |  |  |
| 1 | (Constant) | 211.105 | 10.511 |  | 20.084 | . 000 |
|  | Area | 3.078 | 1.718 | . 106 | 1.792 | . 077 |
|  | House Size(Square Meters) | . 250 | . 037 | . 477 | 6.806 | . 000 |
|  | Age in Years | -2.320 | .416 | -. 415 | -5.578 | . 000 |
|  | Land Size(Square Meters) | . 008 | . 009 | . 031 | . 873 | . 385 |

a. Dependent Variable: Selling Price(Rs.' 000 )

Using the above SPSS output, you are required to,
a. Identify the dependent variable and independent variables of the regression model.
b. Interpret the value for coefficient of determination (adj. $\mathbf{r}^{2}$ ),
c. Write down the estimated regression line of selling prices of houses on the determinants of selling prices of houses.
d. Explain the overall significant level of the regression model,
e. Construct statistical hypotheses to test the impact of determinants on selling prices and determine the level of significant of each individual variable,

## Question No. 08

i. "There are four component in a time series." Discuss.
(05 Marks)
ii. Alpha Company Limited sells a variety of electronic equipment and home appliances.

For the last four years the following quarterly sales (Rs.'Mn) were reported.

| Year | Quarter |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
|  | Q1 | Q2 | Q3 | Q4 |
| 2013 | 51 | 41 | 64 | 67 |
| 2014 | 46 | 38 | 54 | 69 |
| 2015 | 42 | 38 | 55 | 61 |
| 2016 | 52 | 43 | 61 | 67 |

Using the above data,
a. Plot a time-series graph.
b. Estimate the Ordinary Least Square (OLS) trend equation.
c. Use the trend equation to forecast the sales of Alpha Company Limited for the first semester of year 2017.
d. Compute four quarter moving averages and central moving averages of sales and mark them on the same graph.
e. Determine seasonal index for each quarter using ratio to moving average method.

