

# International Islamic University Chittagong

Department of Economics & Banking

Final Examination: Spring-2019

Program: BSS(Honors)

Course Code: STAT-3503

Time: 2.5 Hours

Course Title-Statistics for Economists

Full Marks: 50

Answer any FIVE of the following questions. All parts of a question must be answered sequentially. Figures in the right margin indicate full marks.

1 (a) What is test statistic? What are the different types of test statistic? 03

(b) Twelve peoples were appointed as probationary officers in a renowned bank. Their performance was recorded by taking a test and marked out of 50. After completing a six months training, another test was recorded (out of 50) which are noted below; 07

Scores before training (out of 50)	30	32	35	30	40	42	36	33	28	26	38	34
Scores after training (out of 50)	40	39	44	37	42	46	37	39	33	32	40	38

Test whether the training is benefited for Employees or not. (Where at the 5% level of significance, the tabulated t- value with 11 df is 2.201)

2 (a) The average experience of 24 employees of a renowned company is 12.55 years and sample standard deviation is 2.30 years. At 5% level of significance, test whether the population average is equal to 17 years or not. (Where at the 5% level of significance, the tabulated t- value with 23 df is 2.069) 03

(b) In order to gain greater compliance with highway speed limits, an experiment is conducted in which the speeds of automobiles were checked by radar under two different conditions: simulated patrol cars visible along the highway versus patrol cars absent. A total of 14 observations were made under both conditions. The results of speeds (mile/hour) were as follows: 07

	Patrol cars absent	Visible patrol cars
Sample Mean	66.50	55.86
Sample variance	36.1	30.25
Sample size	13	12

- i) What is the appropriate null hypothesis?  
 ii) Test the null hypothesis corresponding to (i) and comment.  
 (Where at the 5% level of significance, the tabulated t- value with 23 df is 2.069)

3 (a) Write the test statistic's corresponding to the followings tests. 03

- (i) Test the single mean.  
 (ii) Test the equality of two means.  
 (iii) Test the equality of two proportions.

(b) A motorcycle manufacturer company has developed a new fuel-efficient automobile engine and has already determined average gas mileage estimates for highway driving. Assume that the company is now interested for testing hypotheses about the variability in miles per gallon (MPG) for the new engine relative to the old one. The engineers are unsure if variability will increase or decrease. The variance of the previous engine is 5.5 MPG squared. In a test of highway driving with a sample of 10 with new engines, the sample mean and variance are 50 MPG and 6.8 MPG squared respectively. 07

- (i) Test whether average mileage is equal to 60 MPG or not.  
 (ii) Test whether the variance in MPG has changed or not. ( Use  $H_0: \sigma^2 = 5.5$  and  $H_A: \sigma^2 \neq 5.5$ )  
 (Where at the 5% level of significance, the tabulated t- value with 9 df is 2.262, and tabulated chi-square value with 9 df is 16.91)

- 4 (a) An investigator obtained the following data on the effectiveness of inoculation as a means of preventing from a disease. By using chi-square statistic, test the hypothesis  $H_0$ : Inoculation has no preventive effect. 03

	Diseased	Non-Diseased	Total
Inoculated	15	25	40
No Inoculated	40	20	60
Total	55	45	100

[where at the 5% level of significance, the tabulated chi-squared value with 1df is 3.841]

- (b) In a random sample of 200 workers from a steel rerolling company, 120 are found to be smokers. In another steel rerolling company, out of 250 workers 200 are found to be smokers. 07
- What is the null hypothesis for testing the difference between the smoking habits of these two companies?
  - What is the test statistics corresponding to the above null hypothesis
  - Conclude about the significant difference between the smoking habits of these two companies.

- 5 (a) What do you mean by time series data? What are the important methods of measuring secular trend? 03

- (b) The following data shows the sales turnover ( in million BDT) of a company. Fit a trend line by using least squares method. 07

Year	2011	2012	2013	2014	2015	2016	2017	2018
sales turnover (in million BDT)	5	7	8	10	11	13	16	18

- Also (i) Determine the expected monthly increasing amount of sales turnover.  
(ii) Estimate the expected amount of sales turnover for the year 2020..

- 6 (a) Describe different components of time series data. What are the mathematical models of a time series? 03

- (b) In an Aluminum Manufacture Company, the figures of production (in '000 tons) are given below; 07

Year	2011	2012	2013	2014	2015	2016	2017	2018
Production	10	11	13	13	16	18	20	25

- Using 3-Year moving average, determine the trend component.
- Plot the original and trend obtained by 3-Year moving average on the same paper.
- Determine mean squared error (MSE).

- 7 (a) What is ANOVA? Write the name of some common designs. 03

- (b) In a certain departmental store had four sales men, Mr. Anan, Mr. Bike, Mr. Cano Raul, and Mr. Dan, each of whom sent for a month to three types of area - rural, semi urban and urban. The sales in thousand taka per month are shown below; 07

	Mr. Anan	Mr. Bike	Mr. Cano Raul	Mr. Dan
Rural	30	40	42	35
Semi urban	45	62	40	50
Urban.	80	85	76	65

Write down appropriate null hypothesis and calculate the relevant F ratio by carrying out a two way ANOVA.

[where at the 5% level of significance, the tabulated F- value with (3,df is 3.841]