

K. J. Somaiya Institute of Management Studies and Research

Program: PGDM-FSTrimester I

**Subject: Business Statistics
(EndTerm Examination)**

Maximum marks: 50
Duration: 3 hours

Date: 26th September, 2016

Notes:

- 1. You have to attempt 4 questions in all. Question 1 is compulsory and carries 20 marks. Do any 3 questions out of remaining 5.**
- 2. Make suitable assumptions if required and state them.**
- 3. Write all relevant answers and interpretations in your answer sheet, with sufficient details to enable a fast evaluation of your answers.**
- 4. Use Excel as required and keep saving the file on the desktop every ten minutes or so.**
- 5. Name the file with your division and roll number only (no names). Finally, before handing over the answer sheet, transfer the file to an exam folder, as per on-the-spot instructions given to you.**

1. Chemical, Industrial, and Pharmaceutical Laboratories (Cipla): A Leading Player in the Indian Pharmaceutical Industry

Khawaja Abdul Hamied incorporated the Chemical, Industrial, and Pharmaceutical Laboratories, which came to be popularly known as Cipla. Cipla was registered as a public limited company with an authorized capital of Rs. 60,000 million in 1935. Operations officially started in September 1937 when its first product was launched in the market. The *Sunday Standard* reported, "The birth of Cipla which was launched by Dr. K. A. Kamied will be red lettered day in the annals of industries in Bombay. The first city in India can now boast of a concern, which will supersede all existing firms in the magnitude of its operations.

Cipla's products and services are categorized as prescription, animal health care products, over-the-counter (OTC) products, bulk drugs, and technology services. The prescription division covers medicines for a variety of human diseases. The OTC products manufactured by Cipla include a range of drugs such as analgesics, artificial sweeteners, cosmetics and skin care products, dental care and oral hygiene products, food supplements, toiletries, infant foods, medical plasters, etc. The animal health care products are further categorized as per animal groups, herbal specialties, and therapeutic groups. The drugs produced under this category are equine products, poultry products, products from companion animals, and products for livestock. Bulk drugs include active pharmaceutical ingredients and drug

intermediates. Technology services provided by Cipla include consulting, project appraisal, engineering, plant supply and commissioning, training, operation management, support, know-how transfer, and quality control.

The domestic pharmaceutical industry in India grew at more than double the rate, recording a 11% growth in value as per ORG-IMS, compared to 4.2% during 2004-2005. For the first time, the company's turnover crossed the Rs. 30 billion. Once again, this was way more than the overall growth rate of the industry. Cipla now exports to countries in Europe, Australia, Africa, Asia, the Middle East, and North, Central, and South America. The company's steady progress won it the "Express Pharma Pulse Award" for "sustained growth" for 2005-2006. Cipla is one of a handful of companies in India that has consistently increased its turnover and profitability in the past 15 years in a row.

Cipla overtook Ranbaxy and GlaxoSmith Kline (GSK) to become the largest pharmaceutical company in the domestic market for the first time in 2007.

The following table represents sales turnover of Cipla Ltd. from the year 1989 – 2006:

Year	Sales (in Million Rupees)	Year	Sales (in Million Rupees)
1989	971.3	1998	5170.8
1990	928.9	1999	6255.4
1991	1236.4	2000	7721.4
1992	1514	2001	10643.1
1993	1990.3	2002	14008.1
1994	2454.7	2003	15730.2
1995	2987.1	2004	20554.3
1996	3623.6	2005	24008.9
1997	4525.8	2006	31036.2

The data is also provided in **Excel WorksheetPG FS Data Set Ques 1**.

- a. Use an appropriate graphical technique to represent the data.
- b. Calculate mean, median mode, standard deviation, and variance and interpret your findings?
- c. Construct an ogive for the data and discuss the results.
- d. Also construct box plot for this data and identify the outliers. Interpret your findings.

2.

10 Marks

- a. For the 2010-2011 viewing season, the top five syndicated programs were *Wheel of Fortune* (WoF), *Two and Half Men* (THM), *Jeopardy* (Jep), *Judge Judy* (JJ), and the *Oprah Winfrey Show* (OWS). Data indicating the preferred shows for a sample of 50 viewers is tabulated in **Excel WorksheetPG FS Data Set Ques 2a**.

- i. Are these data categorical or quantitative?
 - ii. Construct an appropriate chart to represent the proportion of programs being viewed. Interpret your findings.
- b. According to a survey conducted by TD Ameritrade, one out of four investors have exchange-traded funds in their portfolios. Consider a sample of 20 investors. Assuming distribution to be binomial, answer the following questions:
 - i. Compute the probability that at least 6 of the investors have exchange-traded funds in their portfolios.
 - ii. Compute the probability that exactly 4 investors have exchange-traded funds in their portfolios.
 - iii. Compute the expected number of investors who have exchange-traded funds in their portfolios.

3.

10 Marks

- a. A recent article reported that there are exactly 11 minutes of actual playing time in a typical National Football League (NFL) game. The article included information about the amount of time devoted to replays, the amount of time devoted to commercials, and the amount of time the players spend standing around between plays. Data consistent with the findings is provided in **Excel Worksheet PG FS Data Set Ques 3a**. These data provide the amount of time players spend standing around between plays for a sample of 60 NFL games. Determine the 95% confidence interval estimate of the mean time spent in minutes players spend standing around between plays.
- b. The operations manager of a large production plant would like to estimate the average amount of time workers take to assemble a new electronic component. After observing a number of workers assembling similar devices, she guesses that the standard deviation is 360 seconds. Assuming the population to be normally distributed, calculate how large a sample of workers should she take if she wishes to estimate the mean assembly time to within 20 seconds? Assume that the confidence level is to be 99%.

4.

10 Marks

- a. The Economic Policy Institute periodically issues reports on wages of entry level workers. The institute reported that entry level wages for male college graduates were \$21.68 per hour and for female college graduates were \$18.80 per hour in 2011. Assume the standard deviation for male graduates is \$2.30, and for female graduates it is \$2.05. Answer the following questions:
 - i. What is the probability that mean wage for a sample of 50 male graduates will be more than \$22.46?

- ii. What is the probability mean wage for a sample of 50 female graduates will be less than \$20.5?
- b. The national mean annual salary for a school administrator is \$80,000 a year. A school official took a sample of 25 school administrators in the state of Ohio to learn about salaries in that state to see if they are greater than the national average. At 5% level of significance, test whether the population mean annual administrator salary in Ohio is greater than the national mean salary of \$80,000. **Use Excel Worksheet PG FS Data Set Ques 4b.**

5.

10 Marks

- a. In a survey, 150 randomly selected employees out of a total of 500 employees stated that they are happy in their current job. Construct a 95% confidence interval for estimating the population proportion of employees who are happy in their present job position.
 - b. The mean hourly wage for employees in goods-producing industries is currently \$24.57. To test the claim, a statistician took a random sample of 30 employees which showed a sample mean of \$23.89 per hour. Assuming a population standard deviation of \$2.40 per hour, can we conclude at the 10% significance level that the claim is true?
6. Attempting to analyze the relationship between advertising and sales, the owner of furniture store recorded the monthly advertising budget in 1000 Rs. and the sales in 10,000Rs. for a sample of 12 months. The data are listed in **Use Excel Worksheet PG FS Data Set Ques 6.**
- a. Determine coefficient of correlation. What does it tell you about the linear relationship between advertising and sales?
 - b. Draw a scatter diagram of the data. Does it appear that advertising and sales are linearly related?
 - c. Calculate and interpret the error term and coefficient of determination.
 - d. Calculate the linear regression line. Interpret your findings.
 - e. Test the significance of the overall model.

10 Marks

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