



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FIFTH SEMESTER – APRIL 2016

ST 5507 - COMPUTATIONAL STATISTICS

Date: 03-05-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

Answer any THREE questions. Each question carries 34 marks.

(Max: 100 Marks)

1. a) Fit a straight line trend to the following data:

Year : 1976 1977 1978 1979 1980 1981 1982 1983

Sales: 76 80 130 144 138 120 174 190

(Rs.Lakhs)

Also estimate sales for the year 1990.

(14)

b) Find seasonal indices using ratio to moving average method for the following data:

(20)

Quarter

| Year | I | II | III | IV |
|------|----|----|-----|----|
| 2008 | 30 | 40 | 36 | 34 |
| 2009 | 34 | 52 | 50 | 44 |
| 2010 | 40 | 58 | 54 | 48 |
| 2011 | 57 | 78 | 68 | 62 |
| 2012 | 86 | 92 | 80 | 82 |

2) a) For the following data:

| Commodity | Base year | | Current year | |
|-----------|-----------|----------|--------------|----------|
| | Price | Quantity | Price | Quantity |
| A | 10 | 12 | 15 | 10 |
| B | 16 | 14 | 20 | 12 |
| C | 12 | 15 | 14 | 13 |
| D | 18 | 18 | 22 | 16 |
| E | 20 | 22 | 25 | 20 |

Find i) Fisher ii) Walsh iii) Dorbish-Bowley

iv) Marshall-Edgeworth price index numbers

(14)

b) Find seasonal indices using ratio-to-trend method for the following data:

(20)

Quarter

| Year | I | II | III | IV |
|------|----|----|-----|----|
| 2000 | 40 | 44 | 46 | 48 |
| 2001 | 50 | 53 | 55 | 59 |
| 2002 | 47 | 50 | 52 | 55 |
| 2003 | 55 | 59 | 61 | 65 |

3) (a) The National Association of Home Builders provided data on the cost of the most popular home remodeling projects. Sample data on cost in thousands of dollars for two types of remodeling projects are as follows.

| | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|
| Kitchen | 25 | 17 | 22 | 21 | 19 | 23 | 19 | 16 | 21 | 23 |
| masterbedroom | 18 | 22 | 26 | 24 | 26 | 17 | 24 | 21 | | |

Develop a 95% confidence interval for the difference between the two Population means.

(10)

(b) Fit a Poisson distribution to the following data and test the goodness of fit:

| | | | | | | | |
|-----------------|-----|----|----|----|----|---|---|
| No.of accidents | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| No. of days | 150 | 65 | 45 | 34 | 10 | 6 | 2 |

(14)

(c) The Dow Jones Industrial Average varies as investors buy and sell shares of the 30 stocks that make up the average. Samples of the Dow Jones Industrial Average taken at different times during the first 5 days of November 1997 and the first 5 days of December 1997 are as follows:

| | | | | | | | | | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| November | 749 | 752 | 776 | 749 | 755 | 769 | 765 | 760 | 750 | 770 |
| December | 806 | 820 | 784 | 794 | 784 | 800 | 800 | 805 | 820 | 800 |

Using a .05 level of significance, test to determine whether the population variances for the two time periods are equal. (10)

- 4) Consider a population of 6 units with values : 1, 2, 4, 7, 8, 9
- Write down all possible samples of size 3 without replacement from this population
 - Verify that the sample mean is an unbiased estimate of the population mean
 - Calculate the Sampling variance and verify that it agrees with the variance of the sample mean under SRSWOR.
 - Also, Verify that the Sampling Variance is less than the variance of the Sample mean which is obtained from SRSWR. (34)

- 5) (a) Let X denote the length of time in seconds between two calls entering a college switchboard. Let m be the unique median of this continuous-type distribution. Test the null hypothesis $H_0 : m = 6.2$ against the alternative hypothesis $H_1 : m < 6.2$ using a random sample of size 20 given below:
6.8, 5.7, 6.9, 5.3, 4.1, 9.8, 1.7, 7.0, 2.1, 19.0, 18.9, 16.9, 10.4, 44.1, 2.9, 2.4, 4.8, 18.9, 4.8, 7.9. Find the **significance level α** if the critical region $C = \{y \mid y \geq 14\}$, where 'y' is the number of lengths of time in a random sample of size 20 that are less than 6.2. Find the p-value of this sign test. (8)

- (b) A man buys 50 electric bulbs of Philips and 50 electric bulbs of Crompton. He finds that Philips bulbs give an average life of 1500 hours with standard deviation of 60 hours and Crompton bulbs give an average life of 1512 hours with a standard deviation of 80 hours. Is there a significant difference in the mean life of the two makes of bulbs? (8)

(c) A vendor produces and sells low-fat milk powder to a company that uses it to produce health drink formulae. In order to determine the fat content of the milk powder, both the company and the vendor take a sample from each lot and test it for fat content in percent. Ten sets of paired test results are

| Lot Number | Company Test Results (X) | Vendor Test Results (Y) |
|------------|--------------------------|-------------------------|
| 1 | 0.50 | 0.79 |
| 2 | 0.58 | 0.71 |
| 3 | 0.90 | 0.82 |
| 4 | 1.17 | 0.82 |
| 5 | 1.14 | 0.73 |
| 6 | 1.25 | 0.77 |
| 7 | 0.75 | 0.72 |
| 8 | 1.22 | 0.79 |
| 9 | 0.74 | 0.72 |
| 10 | 0.80 | 0.91 |
| 11 | 0.92 | 0.74 |
| 12 | 0.58 | 0.55 |

Test the hypothesis $H_0 : p = P[X > Y] = \frac{1}{2}$ against the one – sided alternative $H_1 : p > \frac{1}{2}$ using the critical region $C = \{w \mid w \geq 7\}$, where 'w' is the number of pairs for which $X_i - Y_i > 0$. Find the **significance level α** and **p – value** of this test. (18)