

**POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)**

**Term-End Examination**

**December, 2016**

00311

**MSTL-002/S2 : INDUSTRIAL STATISTICS LAB SET-2**

Time : 3 Hours

Maximum Marks : 50

- Note :**
- (i) Attempt any *two* questions.
  - (ii) Solve the questions in *Microsoft Excel*.
  - (iii) Use of *Formulae and Statistical Tables Booklet for PGDAST* is allowed.
  - (iv) Mention necessary steps, hypotheses, interpretation, etc.

1. (a) The following data related to the life (in hours) of 15 random samples of 5 electric bulbs each, drawn at intervals of one hour from a production process :

| Sample Number | Life-times (in hours) |       |       |       |       |
|---------------|-----------------------|-------|-------|-------|-------|
|               | $x_1$                 | $x_2$ | $x_3$ | $x_4$ | $x_5$ |
| 1             | 1620                  | 1685  | 1660  | 1760  | 1800  |
| 2             | 1501                  | 1585  | 1525  | 1590  | 1650  |
| 3             | 1675                  | 1702  | 1686  | 1567  | 1625  |
| 4             | 1650                  | 1625  | 1572  | 1630  | 1640  |
| 5             | 1500                  | 1980  | 1659  | 1643  | 1660  |
| 6             | 1634                  | 1755  | 1625  | 1690  | 1770  |
| 7             | 1635                  | 1723  | 1614  | 1535  | 1550  |
| 8             | 1482                  | 1791  | 1533  | 1619  | 1497  |
| 9             | 1706                  | 1524  | 1625  | 1504  | 1670  |
| 10            | 1530                  | 1432  | 1380  | 1690  | 1724  |
| 11            | 1490                  | 1500  | 1605  | 1595  | 1650  |
| 12            | 1590                  | 1535  | 1762  | 1590  | 1625  |
| 13            | 1460                  | 1490  | 1635  | 1587  | 1555  |
| 14            | 1722                  | 1608  | 1665  | 1590  | 1530  |
| 15            | 1470                  | 1409  | 1650  | 1590  | 1550  |

Draw the  $\bar{X}$  and R charts and comment whether the process is under control. If not, draw the revised charts.

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- (b) The data given below represent the number of defects noted per 100 metres in a telephone cable :

| Sample No. | No. of Defects | Sample No. | No. of Defects |
|------------|----------------|------------|----------------|
| 1          | 10             | 11         | 8              |
| 2          | 5              | 12         | 6              |
| 3          | 13             | 13         | 9              |
| 4          | 2              | 14         | 11             |
| 5          | 19             | 15         | 15             |
| 6          | 24             | 16         | 8              |
| 7          | 1              | 17         | 3              |
| 8          | 1              | 18         | 6              |
| 9          | 3              | 19         | 7              |
| 10         | 7              | 20         | 4              |

Analyse the data with a suitable chart. Would you conclude that the process is in statistical control? If not, draw the revised chart. 10

2. The data given below gives the average monthly prices of a commodity for four years :

| Month     | Year |      |      |      |
|-----------|------|------|------|------|
|           | 2000 | 2001 | 2002 | 2003 |
| January   | 180  | 200  | 220  | 240  |
| February  | 200  | 220  | 190  | 240  |
| March     | 180  | 190  | 200  | 220  |
| April     | 170  | 180  | 180  | 200  |
| May       | 150  | 160  | 170  | 180  |
| June      | 160  | 200  | 180  | 220  |
| July      | 170  | 240  | 240  | 250  |
| August    | 190  | 230  | 250  | 260  |
| September | 210  | 230  | 260  | 270  |
| October   | 230  | 240  | 240  | 260  |
| November  | 230  | 240  | 250  | 270  |
| December  | 240  | 260  | 270  | 290  |

- (a) Calculate the seasonal variation indices using moving average method.  
 (b) Obtain the deseasonalised values.  
 (c) Estimate the trend line by method of least squares.  
 (d) Plot the given data and the deseasonalised values. 14+3+5+3

3. A study was conducted to examine those variables which are thought to be related to the job satisfaction of employees of a non-professional organisation. A random sample of 15 employees is selected and the data are given below :

| Score on Job Satisfaction Test | Coded Intelligence Score | Index of Personal Adjustment |
|--------------------------------|--------------------------|------------------------------|
| 54                             | 15                       | 8                            |
| 37                             | 13                       | 1                            |
| 30                             | 15                       | 1                            |
| 48                             | 15                       | 7                            |
| 37                             | 10                       | 4                            |
| 37                             | 14                       | 2                            |
| 31                             | 12                       | 3                            |
| 49                             | 1                        | 7                            |
| 43                             | 3                        | 9                            |
| 12                             | 15                       | 1                            |
| 30                             | 14                       | 1                            |
| 37                             | 14                       | 2                            |
| 61                             | 9                        | 10                           |
| 31                             | 8                        | 1                            |
| 31                             | 4                        | 5                            |

- (a) Prepare a matrix plot to get an idea about the relationship among the variables.
- (b) Develop a regression model and perform its analysis at 5% level of significance.
- (c) Check linearity and normality assumptions for the fitted regression model.

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