

## POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

## Term-End Examination

June, 2018

## MSTL-002/S1 : INDUSTRIAL STATISTICS LAB SET-1

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, interpretations, etc.

1. (a) A manufacturing company produces bearings. The diameter specified for the bearings is 5 millimetres. In every 30 minutes, five bearings are sampled and their diameters are measured. Data of 25 samples are given below :

Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
5.13	4.92	5.01	4.88	5.06
4.96	4.98	4.95	4.96	5.01
5.12	4.87	5.02	4.08	5.12
5.02	5.09	4.99	5.02	5.03
5.12	5.08	5.09	5.20	5.06
Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
4.97	4.98	5.02	4.97	4.99
4.89	4.80	5.20	5.00	5.02
5.04	4.96	5.01	5.02	5.20
5.01	4.96	5.40	4.91	4.87
5.13	5.03	4.99	4.96	5.14
Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
4.98	4.99	4.91	4.93	5.04
5.01	5.01	4.97	4.91	5.02
5.04	5.02	5.50	4.96	5.05
4.96	5.01	4.96	4.99	4.82
4.99	5.04	4.99	4.97	5.01

Sample 16	Sample 17	Sample 18	Sample 19	Sample 20
5.4	4.90	4.82	5.01	5.20
4.93	4.95	4.96	5.05	4.97
5.12	5.60	5.01	4.96	4.93
5.03	5.20	4.96	4.90	4.85
4.98	4.96	5.02	5.04	5.03
Sample 21	Sample 22	Sample 23	Sample 24	Sample 25
5.09	5.07	5.12	5.04	5.10
5.04	5.03	5.09	5.01	4.50
4.97	5.01	4.98	4.92	5.2
5.02	5.01	4.88	4.86	4.89
4.97	4.99	5.05	4.9	5.02

Draw suitable control charts for process variability and process mean and comment whether the process is under control. If not, draw the revised charts.

15

- (b) The average annual salaries (in million rupees) of employees of a company for the period 2000 to 2017 are as follows :

Year	Average Salary	Year	Average Salary	Year	Average Salary
2000	1.45	2006	1.95	2012	1.90
2001	1.55	2007	2.04	2013	1.88
2002	1.61	2008	2.06	2014	1.67
2003	1.60	2009	1.80	2015	1.65
2004	1.74	2010	1.73	2016	1.73
2005	1.92	2011	1.77	2017	1.88

- (i) Compute the weighted moving averages for a period of 3 years for the weights 0.2, 0.3 and 0.5. Plot the results along with original data.
- (ii) Using a smoothing coefficient of 0.5, compute exponentially smoothing series. Plot the results along with original data.

5+5

2. A researcher wants to develop a regression model to predict the market price (in lakh rupees) of a house and considers three predictor variables, viz. Total area (in square feet), Age of the house (in years) and Area of parking space (in square feet). The data are given below :

Market Price	Total Area	Age of House	Area of Parking Space
40.0	1605	15	200
42.0	2489	25	351
45.2	1552	10	218
50.2	2404	12	326
43.9	1884	15	385
53.5	1558	10	273
44.9	1748	6	345
58.0	3105	8	409
40.7	1682	15	397
42.0	2470	15	384
59.5	1820	2	326
63.9	2143	6	364
59.7	2121	10	383
64.5	2485	9	405
60.2	2300	15	317
89.5	2714	4	406
82.5	2463	5	338
101.0	3076	7	419
84.9	3048	3	402
108.0	3267	6	457
95.0	3069	5	413
88.5	4765	20	507
110.0	4540	8	502

- (a) Build a regression model by selecting appropriate regressors in the model by using backward elimination method.
- (b) Prepare a scatter matrix to get a rough idea about the relationship among the variables selected in the regression model.
- (c) Check the linearity and normality assumptions for the regression analysis.

10+5+10

3. (a) The following data gives the average quarterly prices of a commodity for five years :

Year \ Quarter	2013	2014	2015	2016	2017
I	130	135	131	131	134
II	126	128	129	131	136
III	122	122	128	125	126
IV	131	136	132	135	133

- (i) Compute seasonal indices using ratio to moving average method.  
(ii) Obtain deseasonalized values and then fit a linear trend line to the annual prices using method of least squares.  
(iii) Plot the original data, deseasonalised data, and trend values.

$$6+6+3=15$$

- (b) A company produces bond paper and random samples of size 50 are inspected at regular intervals of time. Data on defective number of papers in 20 such random samples are given below :

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

Construct a suitable chart for the above data and state whether the process is under statistical control. If not, draw the revised chart.

10