

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)**Term-End Examination****June, 2016****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, hypothesis, interpretation, etc.
 - (v) Symbols have their usual meanings.

1. (a) A new production line is designed to dispense 12 ounces (oz) of a drink into each can as it passes along the line. Regardless of the care taken, there will be some variability in the amount of drink dispensed per can. The process will be considered out of control, if the mean amount of fill appears to differ considerably from the average fill obtained when the process is operating correctly or if the variability in fill appears to differ greatly from the variability obtained in a properly operating system. To check the process, the quality control inspector selects four cans (from the production line) each hour for a 24-hour period and measures the weight of each selected can. The results are given below :

Sample Number	Weight (oz) per can			
1	12.04	12.00	12.13	12.11
2	12.09	12.11	11.85	11.93
3	11.95	11.86	11.89	11.99
4	12.42	12.30	12.24	12.35
5	11.84	11.90	11.95	11.92
6	12.02	12.01	12.22	12.00
7	12.40	12.03	11.80	12.02
8	11.86	11.97	12.01	11.86
9	12.06	12.03	11.85	11.98
10	12.04	12.05	12.08	12.02
11	12.01	11.74	11.96	11.95
12	11.94	11.89	11.95	12.07
13	12.16	11.98	12.06	11.91

Sample Number	Weight (oz) per can			
	14	11.97	11.96	12.18
15	11.79	12.11	11.88	12.03
16	12.02	11.99	12.06	11.96
17	12.00	11.83	11.96	11.94
18	12.12	11.98	11.60	12.40
19	11.94	11.80	12.04	11.97
20	11.95	12.06	11.91	11.93
21	12.24	11.94	11.93	12.12
22	11.94	12.00	11.98	11.83
23	11.99	12.13	11.90	12.00
24	12.12	11.86	11.90	12.07

- (i) Which control charts should be used to check whether the process is under statistical control or not ?
- (ii) Construct these charts and comment about the process on the basis of the charts.
- (iii) Plot revised control charts, if necessary. 2+6+7

(b) A quality control technician notes the number of defects (per 100 square metres) on paper, but the area of paper inspected for each sample varies. The results of 20 inspections are shown in the following table :

Sample No.	Area of Paper Inspected (in square metres)	No. of Defects	Sample No.	Area of Paper Inspected (in square metres)	No. of Defects
1	300	7	11	200	5
2	200	8	12	250	9
3	250	5	13	100	6
4	150	5	14	250	8
5	250	10	15	300	6
6	100	4	16	250	5
7	200	5	17	150	9
8	150	8	18	200	7
9	150	8	19	150	6
10	250	6	20	300	10

- (i) Construct a suitable control chart for the number of defects per 100 square metres.
- (ii) Comment whether the process is under statistical control or not.
- (iii) Calculate the revised control limits, if necessary. 6+1+3

2. An agent of a real estate company would like to predict the selling price of a flat. The variables likely to be most closely related to selling price are the size of the flat, age of the flat, number of rooms in the flat and distance of the flat from the metro station. A random sample of 40 recently sold flats is taken and the selling price (in lakhs), the flat size (in square feet), age (in years), distance from the metro station (in kms) and the number of rooms in the flat are recorded as follows :

Flat	Selling Price (in lakhs)	Flat Size (in square feet)	Age (in years)	Distance from Metro station (in kms)	Number of Rooms
1	65.2	1316	10	1	2
2	68.0	1420	7	2	3
3	64.5	1550	5	4	2
4	66.0	1546	9	3	2
5	57.0	1354	8	2	2
6	75.0	1620	5	4	5
7	62.3	1300	15	2	3
8	64.5	1450	6	2	2
9	63.0	1380	4	4	2
10	64.8	1540	11	3	5
11	70.4	1600	5	2	5
12	64.7	1490	2	1	3
13	62.0	1370	5	3	3
14	77.3	1740	5	2	5
15	64.3	1460	7	3	4
16	59.5	1320	10	3	2
17	70.5	1400	4	1	5
18	64.3	1320	5	1	3
19	65.8	1550	10	2	3
20	68.8	1520	10	2	4
21	65.8	1438	15	4	3
22	66.2	1543	9	3	5
23	70.4	1520	10	1	5
24	60.0	1427	13	2	3
25	64.3	1460	2	4	4
26	63.4	1390	10	2	3
27	64.0	1410	5	5	4
28	75.5	1597	5	1	4
29	62.7	1374	4	2	3
30	63.4	1450	8	4	4

Flat	Selling Price (in lakhs)	Flat Size (in square feet)	Age (in years)	Distance from Metro station (in kms)	Number of Rooms
31	60.6	1490	15	3	5
32	75.4	1640	4	2	6
33	63.0	1395	5	4	4
34	56.1	1310	12	4	2
35	62.0	1520	15	3	5
36	68.2	1600	9	4	6
37	63.8	1530	12	2	5
38	68.4	1570	7	1	5
39	71.8	1410	4	2	4
40	64.5	1350	4	2	3

- (a) Build a regression model by selecting appropriate regressors in the model.
 (b) Estimate selling price of all the 40 flats using the above model. 20+5

3. The sales data of an automobile company during three financial years is given below :

Month	Year		
	2013	2014	2015
April	524	1214	1043
May	1240	1917	1618
June	1406	1999	2680
July	1456	2383	1493
August	1349	2158	1936
September	2085	3477	3505
October	1323	1623	1731
November	1656	2172	1437
December	1935	2101	1546
January	1919	2561	2438
February	1875	1910	2455
March	3650	3796	3376

- (a) Compute the seasonal indices for 12 months using ratio-to-trend method.
 (b) Obtain deseasonalised values.
 (c) Plot the given data along with deseasonalised values. 20+3+2