

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

Term-End Examination 00947

December, 2015

MSTL-002 : INDUSTRIAL STATISTICS LAB

Time : 3 hours

Maximum Marks : 50

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- 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.*
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1. (a) Suppose a dairy product manufacturing company uses automatic machines to fill 500 mL flavoured milk bottles. A quality control inspector at the company collects 20 samples each of four observations at different times and measures the volume of each filled bottle. The data are given in the following table : 15

Table : Volume of Flavoured Milk

Sample Number	Volume of flavoured milk per bottle (in mL)			
	Obs. 1	Obs. 2	Obs. 3	Obs. 4
1	497	500	498	497
2	505	500	498	500
3	499	497	498	498
4	499	496	498	497
5	498	500	499	500
6	499	500	499	500
7	499	498	497	496
8	499	498	500	498
9	499	498	500	502
10	498	497	499	498
11	498	500	501	499
12	498	501	500	499
13	497	498	497	499
14	499	498	498	501
15	500	500	499	499
16	500	500	499	498
17	501	497	494	496
18	499	500	501	498
19	499	500	499	500
20	497	498	499	497

Develop the $\bar{X}$ and R-charts to check whether the process of bottling is under statistical control or out-of-control. Also, plot the revised control limits, if necessary.

- (b) To monitor the manufacturing of smart phones, a quality controller randomly selects number of smart phones from the production line, each day over a period of 25 days. The smart phones were inspected for defectives and the number of defective smart phones found each day are recorded in the following table : 10

Day	Number of Smart Phones Inspected	Number of Defective Smart Phones
1	50	2
2	52	4
3	57	4
4	50	11
5	50	4
6	48	2
7	51	4
8	54	6
9	52	5
10	50	1
11	55	6
12	60	3
13	55	6
14	55	5
15	52	1
16	48	4
17	50	3
18	56	6
19	52	2
20	53	4
21	50	3
22	55	1
23	50	5
24	50	3
25	47	4

Construct the suitable control chart and comment whether the process is under statistical control or not. Also compute the revised control limits, if necessary.

2. A sample of 20 houses was selected to develop a linear model for the electricity consumption of a household and to predict the electricity consumption during summers. We have recorded the electricity consumption (in kWh), size of house (in Sq.ft.), and AC (0 for no AC and 1 for having AC) in the following table : 25

Table : Electricity Consumption Data

S. No.	Unit (in kWh)	Area (in Sq. ft.)	AC	S. No.	Unit (in kWh)	Area (in Sq. ft.)	AC
1	513	725	1	11	736	825	1
2	926	1000	1	12	593	850	0
3	706	925	1	13	866	1000	1
4	1046	1300	0	14	780	950	1
5	1196	1400	1	15	920	1100	0
6	1060	1200	1	16	870	1100	0
7	713	825	0	17	806	1075	0
8	516	775	1	18	880	1000	1
9	373	675	0	19	666	875	1
10	1070	1350	0	20	820	1025	0

- Prepare a scatter plot to get an idea about the relationship among the variables.
- Develop a linear regression model and perform related analysis at 5% level of significance.
- Check the linearity and normality assumptions for the regression analysis.
- Draw both fitted regression lines on the scatter plot.

3. Suppose the owner of an ice-cream parlour situated in a locality of a metro city wants to analyse its monthly sales. The data of the total quantity of ice-cream sold every month for past 4 years from 2008 to 2011 are recorded in the following table : 25

Table : Monthly Sales of Ice-cream

Month	Quantity (in litre)	Month	Quantity (in litre)	Month	Quantity (in litre)
1	288	17	824	33	967
2	316	18	802	34	924
3	414	19	812	35	848
4	540	20	776	36	774
5	558	21	767	37	694
6	586	22	738	38	765
7	558	23	689	39	1134
8	548	24	596	40	1224
9	540	25	540	41	1210
10	565	26	630	42	1237
11	465	27	879	43	1248
12	396	28	990	44	1217
13	396	29	1032	45	1215
14	450	30	1020	46	1134
15	648	31	1005	47	1024
16	764	32	1017	48	898

- (a) Compute the seasonal indices for the 12 months.
- (b) Obtain the deseasonalised values.
- (c) Plot the given data and the deseasonalised values.