No. of Printed Pages : 5

MSTL-002/S2

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

00385

June, 2018

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, interpretations, etc.

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1. (a) The manager of a local bank wants to study waiting times of customers for better service during the lunch hour. A sub-group of four customers is selected (one at each 15 minute interval during the lunch hour) and the time (in minutes) is measured from the point each customer enters the line to when he or she reaches the teller window. The results over a four-week period are as follows :

Day	Time (in minutes)			
1	7·2	8·4	7·9	4·9
2	5·6	8·0	3·3	4·2
3	5·5	7·3	3·2	6·0
4	4·4	8·0	5·4	7·4
5	9·7	4·6	4·8	5·8
6	8·3	8·9	9·1	6·2
7	4·7	6·6	5·3	5·8
8	8·8	5·5	8·4	6·9
9	5·7	4·7	4·1	4·6
10	3·7	14·0	3·0	5·2
11	2·6	3·9	5·2	4·8
12	4·6	2·7	6·3	3·4
13	4·9	6·2	7·8	8·7
14	7·1	6·3	8·2	5·5
15	7·1	5·8	6·9	17·0
16	6·7	6·9	7·0	9·4
17	5·5	6·3	3·2	4·9
18	4·9	5·1	3·2	7·6
19	7·2	8·0	4·1	5·9
20	6·1	3·4	7·2	5·9

Draw suitable control charts for process mean and process variability. Comment whether the process is under statistical control. If not, draw the revised charts. *15*

(b) Suppose a rice shopkeeper wants to analyse his monthly sales. The data of the total quantity of rice sold (in kg) every month for 3 years from 2015 – 2017 are recorded in the table given below :

Month	Sale	Month	Sale	Month	Sale
1	396	13	689	25	848
2	396	14	596	26	774
3	450	15	540	27	694
4	648	16	630	28	765
5	764	17	879	29	1134
6	824	18	990	30	1224
7	802	19	1032	31	1210
8	812	20	1020	32	1237
9	776	21	1005	33	1248
10	767	22	1017	34	1217
11	760	23	967	35	1215
12	738	24	924	36	1134

(i) Compute 3- and 6-monthly moving averages. Plot the results along with the data.

(ii) Use the exponential smoothing coefficients of 0·5 and 0·1 to compute the exponentially smoothed series. *6+4*

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

Market price	Total area	Age of house
40·0	1605	15
42·0	2489	25
45·2	1552	10
50·2	2404	12
43·9	1884	15
53·5	1558	10
44·9	1748	6
58·0	3105	8
40·7	1682	15
42·0	2470	15
59·5	1820	2
63·9	2143	6
59·7	2121	10
64·5	2485	9
60·2	2300	15
89·5	2714	4
82·5	2463	5
101·0	3076	7
84·9	3048	3
108·0	3264	6
95·0	3069	5
88·5	4765	20
110·0	4540	8

(i) Prepare a scatter matrix to get a rough idea about the relationship among the variables.

(ii) Develop a multiple linear regression model using the matrix approach.

(iii) Test the significance of the fitted model at 5% level of significance and construct the 95% confidence interval of the regression parameters.

(iv) Also check the linearity and normality assumptions for the fitted model.

5+8+6+6

3. (a) The data given below represents the profit (in million rupees) of a company on a monthly basis from January 2014 to December 2017 :

Month	Year			
	2014	2015	2016	2017
January	2·87	2·86	2·95	3·19
February	2·84	2·90	2·96	3·28
March	3·04	3·09	3·13	3·33
April	3·50	3·28	3·30	3·43
May	3·59	3·53	3·46	3·60
June	3·92	3·97	4·05	3·89
July	3·97	4·06	4·16	4·02
August	3·76	4·03	3·82	3·85
September	3·44	3·65	3·43	3·56
October	3·47	3·72	3·52	3·55
November	3·26	3·36	3·42	3·22
December	2·94	3·16	3·20	2·95

(i) Calculate the seasonal indices using ratio to trend method.

(ii) Obtain the deseasonalised values.

(iii) Plot original data and deseasonalised data. *8+5+2*

(b) The table given below indicates the number of medical sponges produced daily and the number that are non-conforming for a period of 32 days :

Day	Sponges produced	Non-conforming sponges	Day	Sponges produced	Non-conforming sponges
1	690	21	17	575	20
2	580	22	18	610	16
3	685	20	19	596	15
4	595	21	20	630	24
5	665	23	21	625	25
6	596	19	22	615	21
7	600	18	23	575	23
8	620	24	24	572	20
9	610	20	25	645	24
10	595	22	26	651	39
11	645	19	27	660	21
12	675	23	28	685	19
13	670	22	29	671	17
14	590	26	30	660	22
15	585	17	31	595	24
16	560	16	32	600	16

Construct a suitable control chart and state whether the process is under statistical control. If not, draw the revised chart. *10*