MSTL-002 (Set-2)

POST GRADUATE DIPLOMA IN APPLIED STATISTICS
(PGDAST)
Industrial Statistics Lab

Duration : 3 hours Maximum Marks : 50

Note : 1. Attempt any two questions.

2. Solve the questions in Microsoft Excel.

3. Use of formulae and Statistical Tables Booklet for PGDAST is allowed.

4. Mention necessary steps, hypotheses, interpretations, etc.

1. 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: (5+8+6+6)

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	512	725	1	11	735	825	1
2	925	1000	1	12	590	850	0

3	705	900	1
4	1045	1350	0
5	1195	1400	1
6	1050	1200	1
7	712	825	0
8	515	750	1
9	370	675	0
10	1060	1350	0

13	865	1000	1
14	780	925	1
15	920	1050	0
16	870	1100	0
17	805	1075	0
18	880	1000	1
19	665	875	1
20	820	1025	0

(a) Prepare a scatter plot to get an idea about the relationship among the variables.

(b) Develop a linear regression model and perform related analysis at 5% level of significance.

(c) Check the linearity and normality assumptions for the regression analysis.

(d) Draw both fitted regression lines on the scatter plot.

2. The following data represent the number of persons visiting a place of interest on a monthly basic from January 2010 to December 2021: (10+12+3)

Months	**No. of Persons (in thousands)**		
	2019	2020	2021
January	90	100	110
February	85	89	93

March	70	74	78
April	60	62	66
May	55	55	58
June	45	47	40
July	30	30	35
August	40	43	45
September	70	65	72
October	120	127	130
November	115	118	118
December	118	120	124

(i) Calculate seasonal indices using ratio-to-moving average method.

(ii) Obtain deseasonalised value and then fit a linear trend line to the deseasonalised data using method of least squares.

(iii) Plot original data and deseasonalised data.

3. (a) The production line data of battery life (in months) produced by a company are given in the following table. 15

Sample No.	**Observations**			
1	27	23	36	24
2	30	17	27	32
3	21	44	22	28
4	40	21	29	24

5	51	34	17	10
6	33	30	28	22
7	30	22	18	12
8	35	48	20	42
9	20	34	15	41
10	22	50	45	44
11	34	22	36	33
12	32	48	32	38
13	34	32	28	23
14	28	30	17	41
15	44	32	22	28
16	26	42	35	32
17	38	40	51	47
18	26	28	34	39
19	42	38	52	36
20	30	32	39	45
21	23	44	48	33
22	28	34	39	44
23	25	29	40	33
24	30	38	44	32
25	38	27	39	22

(i) Which control chart should be used to control the process mean and process variability?

(ii) Construct these charts and check whether the process is under statistical control or not.

(iii) Also plot the revised control chart, if necessary.

(b) The following table gives the results of daily inspection of vacuum tubes for 26 days of a month (5+5)

Day	**Number Inspected**	**No. of Defectives**	**Day**	**Number Inspected**	**No. of Defectives**
1	531	25	14	2330	75
2	1393	60	15	2000	80
3	1420	61	16	2200	85
4	1500	73	17	2270	65
5	1225	45	18	1947	40
6	2000	55	19	2150	75
7	680	25	20	1700	50
8	2380	89	21	2215	68
9	2150	89	22	2395	82

10	2125	55	23	1190	56
11	2415	115	24	850	25
12	2550	115	25	845	30
13	1500	70	26	850	33

(i) Draw a suitable control chart and interpret the result.

(ii) Also plot the revised control chart, if necessary.

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