POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

00263

December, 2017

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, interpretation, etc.*

(v)   *Symbols have their usual meanings.*

1. (a)   A process for manufacture of 4-feet by 8-feet wood grain panels has performed with an average of 2·7 imperfections per 100 panels. Construct a suitable chart to be used in the inspection of the panels and discuss whether the process is under statistical control, if 25 successive 100-panel lots contained the following number of imperfect panels per lot :

4, 1, 0, 3, 5, 3, 6, 4, 1, 4, 0, 1, 4, 2, 3, 8, 4, 2, 1, 3, 0, 2, 6, 1, 3

Also compute the revised central line and control limits and plot the revised control chart, if necessary.   *10*

(b)   A multinational company fills mango juice into cans, advertising as containing 200 ml of the juice. The weights of the juice are taken immediately after filling in the cans and 20 samples each of 4 cans are taken by a random method at an interval of 30 minutes. The sample values are tabulated in the table given below :

Sample No.	Weight of each can (in ml)			
1	215	212	213	220
2	210	208	208	214
3	208	215	217	210
4	212	217	211	212
5	218	215	213	204
6	220	216	214	220
7	225	219	223	220
8	213	223	214	216

Sample No.	Weight of each can (in ml)			
9	209	208	218	205
10	206	208	224	222
11	205	212	220	215
12	203	215	218	218
13	206	218	212	210
14	212	209	215	218
15	215	215	206	216
16	218	217	208	215
17	213	216	205	204
18	210	220	208	210
19	205	215	210	212
20	206	214	212	214

(i)   Which control charts should be used to control the process mean and range of weight of juice filled in cans ?

(ii) Construct these charts and check whether the process is under statistical quality control.

(iii) Also plot the revised control charts, if necessary.   *15*

2.   A company wants to test the effect of age and gender on productivity in terms of units produced by its employees per month. The HR Manager has taken a random sample of 15 employees and collected information about their age and gender as given below :

Employee	Productivity	Age	Gender
1	850	40	Male
2	760	34	Female
3	750	28	Female
4	860	34	Male
5	800	38	Female
6	710	26	Male
7	760	31	Male
8	860	38	Male
9	770	31	Male
10	800	30	Male
11	870	38	Male
12	800	28	Male
13	750	31	Female
14	840	37	Male
15	760	31	Female

For this data :

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

(b) Develop a linear regression model and its related analysis at 2% level of significance.

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

(d) Determine the productivity for the male employee of age 35 years. *25*

3. A meteorologist has taken the data of annual rainfall (in cm) in the region of a particular State from 1970 to 2010. The data is given in the following table :

Year	Rainfall	Year	Rainfall	Year	Rainfall	Year	Rainfall
1970	664	1981	548	1991	624	2001	468
1971	728	1982	417	1992	473	2002	554
1972	447	1983	387	1993	750	2003	744
1973	663	1984	590	1994	343	2004	943
1974	630	1985	556	1995	484	2005	582
1975	451	1986	292	1996	545	2006	581
1976	617	1987	327	1997	419	2007	437
1977	734	1988	494	1998	798	2008	417
1978	491	1989	448	1999	334	2009	617
1979	520	1990	704	2000	465	2010	571
1980	280						

(a) Use the exponential smoothing method with $\alpha = 0.5$ and obtain the smoothed series of observations.

(b) Plot the original and smoothed values in the chart.

(c) Compute the seasonal indices using 4-yearly ratio to moving average method. *25*

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