LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

FOURTH SEMESTER – APRIL 2010

ST 4812 - STATISTICAL COMPUTING - III

Date & Time: 22/04/2010 / 9:00 - 12:00   Dept. No.   Max. : 100 Marks

Answer any THREE questions. Each carries THIRTY FOUR marks.

1a) Analyse the following Latin Square design, stating all the Hypothesis, Anova and Inferences. The data represent the sales in Million dollars of five different industrial products, from five different companies of the five different Years.

Company/Year	1	2	3	4	5
2001	A25	B38	C45	D56	E23
2002	B65	C45	D64	E78	A34
2003	C45	D90	E34	A12	B46
2004	D78	E43	A23	B98	C45
2005	E45	A78	B56	C12	D34

(14marks)

1b) Develop the inter block and intra block analysis of the following BIBD, stating all the Hypothesis, Anova and Inferences. The data represent the yields of seven varieties of Ragi (given in tones) arranged in seven blocks of size3 .

Treat/Blocks	1	2	3	4	5	6	7
1	70	90	98				
2			54	87	98		
3	65			87		90	
4			86			45	65
5	44				98		56
6		45			123	78	
7		65		54			32

(20marks)

2) Bath concentrations are measured hourly in a chemical process. Data (in ppm) for the last32 hours are shown here (read down from left)

160	186	190	206
158	195	189	210
150	179	185	216
151	184	182	212
153	175	181	211
154	192	180	202
158	186	183	205
162	197	186	197

The process target is $\mu_{0=}$ 175ppm

(i) Estimate the process standard deviation (4-marks)

(ii) Construct a Shewhart - cusum for this process using standardized values h=5 and k=1\2.

(10 +20 marks)

3a) The number of defects found in inspecting television set assemblies was as follows for 20 inspection units of five sets each ;

Units :	1	2	3	4	5	6	7	8	9	10
Defects :	2	40	38	63	92	45	18	120	45	38
Units :	11	12	13	14	15	16	17	18	19	20
Defects :	40	73	68	90	63	85	56	72	40	50

Set up a control chart to be used for further production. (14-marks)

3b)

(i) Construct an OC curve for a single sample ,percentage defective , lot by lot sampling plan where n=100 and c=2

(ii) On the graph developed for part (i) show by dotted lines the general shape of the curve for a 100% inspection plan and a plan where n=1000 and c= 20.

(iii) What is the AOQL from the part (ii)? At what value of p does it occur?

(iv) If α=0.05and β=0.10for the plan n part (i), what are the AQL and the LTPD? (20marks)

4a) A diet for a sick person must contain at least 4000 units of vitamins, 50 units of minerals and 1400 units of calories. Two foods A and B are available at a cost of Rs.4 and Rs.3 per unit respectively. If one unit of A contains 200 units of vitamins , 1 unit of minerals and 40 unit of calories and one unit of food B contains 100 units of vitamins, 2 unit of minerals and 40 units of calories, find by simplex method, what combination of food be used to have least cost ?

(17marks)

4b) Solve the NLLP using Lagrange's multiplier method.

Minimize $Z = 6x_1^2 + 5x_2^2 + 3x_3^2 + 4x_1x_2 - 5x_1x_3 + 10$

Subject to the constraints:

$x_1 + 5x_2 + x_3 = 3$

$x_1, x_2, x_3 \geq 0$

(17marks)

5a) A Xerox machine maintained for office use is used and operated by the people in the office who need to make copies. Since the work to be copied varies in length (number of pages of the original) and copies required, the service rate is exponentially distributed, and the requirements for use are considered to follow Poisson distribution. The mean arrival rate is one customer every four minutes and the mean service time is 2.5 minutes. Calculate the average number of customers in the system, average queue length, the average time a customer spends in the system and the average time of a customer waits before being served.

(17marks)

5b) Find the optimum solution to the Integer programming problem.

Minimize $Z = x_1 - x_2$

Subject to $x_1 + 2x_2 \leq 4$

$6x_1 + 2x_2 \leq 9$

$x_1, x_2 \geq 0$: x_1 and x_2 are integers

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