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PROBABILITY AND STATISTICS

IAE-3 QUESTION BANK

PART-A

1. Define Analysis of Variance.
2. Define one-way classification and two way classifications in ANOVA.
3. What are the basic principle of design of experiments?
4. What is Latin Square Design?
5. Write down the ANOVA table for One way classification.
6. Define Replication.
7. Why a 2 x 2 Latin Square is not possible?
8. What is the aim of the design of the experiments?

PART-B

1. Analyse the variance in the following latin square of yields (in kgs) of paddy where A, B, C, D denote the different methods of cultivation.

D	122	A	121	C	123	B	122
B	124	C	123	A	122	D	125
A	120	B	119	D	120	C	121
C	122	D	123	B	121	A	122

Examine whether the different methods of cultivation have given significantly different yields.

2.Analyze 2^2 factorial experiments for the following table.

Treatment	Replications			
	I	II	III	IV
(1)	12	12.3	11.8	11.6
A	12.8	12.6	13.7	14
B	11.5	11.9	12.6	11.8
Ab	14.2	14.5	14.4	15

3. Four varieties A,B,C,D of a fertilizer are tested in a randomized block design with 4 replication. The plot yields in pounds are as follows:

Column / Row	1	2	3	4
1	A(12)	D(20)	C(16)	B(10)
2	D(18)	A(14)	B(11)	C(14)
3	B(12)	C(15)	D(19)	A(13)
4	C(16)	B(11)	A(15)	D(20)

Analyse the experimental yield.

4. The following is a Latin square of a design when 4 varieties of seeds are being tested. Set up the analysis of

variance table and state your conclusion. The following is a Latin square of a design when 4 varieties of seeds are being tested. Set up the analysis of variance table and state your conclusion. Youmay carry out suitable change of origin and scale. (APRIL / MAY '17)

A 105	B 95	C 125	D 115
C 115	D 125	A 105	B 105
D 115	C 95	B 105	A 115
B 95	A 135	D 95	C 115

5. As part of the investigation of the collapse of the roof of a building, a testing laboratory is given all the available bolts that connected the steel structure at 3 different positions on the roof. The forces required to shear each of these bolts (coded values) are as follows:

Position 1 : 90 82 79 98 83 91

Position 2 : 105 89 93 104 89 95 86

Position 3 : 83 89 80 94

Perform an analysis of variance to test at the 0.05 level of significance whether the differencesamong the sample means at the 3 positions are significant.

6.An agriculturist wants to test the effects of four different fertilizers A,B,C and D on the yield of paddy. In order to elimininate sources of error due to variability in self-fertility, he used the fertilizers in a latin square arrangements given below where the numbers indicate yields in quintals per unit area.Perform an analysis of variance to decide there is a difference the fertilizers at 5% level of significance.

A18 C21 D25 B11

D22 B12 A15 C19

B15 A20 C23 D24

C22 D21 B10 A17

7.A company appoints four salesman A,B,C,D to observes sales in three seasons: summer, winter and monsoon. The figures (in laks of Rs.) are given in the following table.

		Salesman			
		A	B	C	D
Seasons	Summer	45	40	38	37
	Winter	43	41	45	38
	Monsoon	39	39	41	41

Is there any significant difference between i)Salesman ii)Seasons

Unit-V

Part-A

1. Write down the objectives of statistical quality control.

2. Define control chart.

3. What are the uses of Quality control chart?

4. What are the different types of control chart?

5. The total number of defects in 20 pieces is 220 .what is the UCL and LCL?

6. What is the tolerance limit?

7. Find the lower and upper control limits for X - chart and R- chart, when each sample is of size 4 and $\overline{\overline{X}} = 10.80$ and $\overline{R} = 0.46$.?

8. A garment was sampled on 10 consecutive hours of production. The number of defects found per garment is given below:

Defects: 5,1,7,0,2,3,4,0,3,2. Compute upper and lower control limits for monitoring number of defects.

Part-B

1.

The following data gives the average life in hours and range in hours of 12 samples each of 5 lamps. Construct $\overline{X}$ - hart and R- chart, comment on state of control.

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
Mean $\overline{X}_i$	120	127	152	157	160	134	137	123	140	144	120	127
Range R_i	30	44	60	34	38	35	45	62	39	50	35	41

2. The Values of sample mean X and sample standard deviation S for 15 samples, each of size 4, drawnfrom a production process are given below. Draw the appropriate control charts for the process average and process variability. Comment on the state of control.

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mean	15	10	12.5	13	12.5	13	13.5	11.5	13.5	13	14.5	9.5	12	10.5	11.5
S.D	3.1	2.4	3.6	2.3	5.2	5.4	6.2	4.3	3.4	4.1	3.9	5.1	4.7	3.3	3.3

3. 15 tape recorders were examined for quality control test. The number of defects in each tape recorder is recorded below. Draw the appropriate control chart and comment on the state of control.

Unit No.(i)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of defects (c)	2	4	3	1	1	2	5	3	6	7	3	1	4	2	1

4. Construct a control chart for defectives for the following data:

Sample No:	1	2	3	4	5	6	7	8	9	10
No. inspected:	90	65	85	70	80	80	70	95	90	75
No. of defectives:	9	7	3	2	9	5	3	9	6	7

5. The data given below are the number of defectives in 10 samples of 100 items each. Construct a p-chartand an np-chart and comment on the results.

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of defectives	6	16	7	3	8	12	7	11	11	4

6. The following data give the measurements of 10 samples each of size 5 in the production process takenin an interval of 2 hours. Calculate the sample means and ranges and draw the control charts for mean and range.

Sample No.	1	2	3	4	5	6	7	8	9	10
Observed	49	50	50	48	47	52	49	55	53	54

measurements X	55	51	53	53	49	55	49	55	50	54
	54	53	48	51	50	47	49	50	54	52
	49	46	52	50	44	56	53	53	47	54
	53	50	47	53	45	50	45	57	51	56

7. The data given below are the number of defectives in 10 samples of 100 items each. Construct a p-chart and an np-chart and comment on the results.

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of defectives	8	14	9	5	6	14	9	13	16	2

8. The following data give the measurements of 10 samples each of size 6 in the production process takenin an interval of 2 hours. Calculate the sample means and ranges and draw the control charts for mean and range.

Sample No.	1	2	3	4	5	6	7	8	9	10
Observed measurementsX	62	50	67	64	49	63	61	63	48	70
	68	58	70	62	98	75	71	72	79	52
	66	52	68	57	65	62	66	61	53	62
	68	58	56	62	64	58	69	53	61	50
	73	65	61	63	66	68	77	55	49	66
	68	66	66	74	64	55	53	57	56	75