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B.E. / B.TECH. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL 2014

PRINTING TECHNOLOGY

(Common to Material Science - III Semester)

Fourth Semester

MA 8352 - Applied Statistics

(Regulation 2012)

(Use of Statistical table may be permitted)

Time: 3 Hours

Answer ALL Questions

Max. Marks:100

Part A

(10 × 2 = 20)

1. Define Type I error and Type II error.
2. The following results are obtained from a sample of 10 boxes of ink bottles. Mean weight content is 490 gm, standard deviation of the weight is 9 gm. Could the sample come from a population having a mean of 500 gm?
3. What are all the advantages of Non-parametric tests?
4. When Mann-Whitney U-test used?
5. Define completely randomized design.
6. What are the assumptions made in the analysis of variance?
7. Write the advantages of control chart.
8. Define process control and product control.
9. Define additive model and multiplicative model.
10. Define irregular variations.

Part B

(5 × 16 = 80)

11. (i) 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. (10)

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

(ii)The following data gives the number of defects found in 30 pieces of cotton goods inspected everyday in a month:

Defects : 1,3,8,2,1,10,0,16,1,12,5,8,9,3,6,8,14,2,7,1,4,6,20,19,5,1,6,1,7,1

Can you say that these data come from a controlled process?

(6)

12. (a) (i) A manufacturing firm claims that its brand A product outsells its brand B product by 8%. If it is found that 42 out of a sample of 200 persons prefer brand A and 18 out of another sample of 100 persons prefer brand B, test whether the 8% difference is a valid claim. (8)

(ii) The table below gives the number of aircraft accidents that occurred during the various days of the week. Test whether the accidents are uniformly distributed over the week. (8)

Days	Monday	Tuesday	Wednes	Thursda	Friday	Saturday
No. of Accidents	14	18	12	11	15	14

(OR)

(b) (i) In a city, a sample of 1000 people was taken and out of them 540 are vegetarians and the rest are non-vegetarians. Can we say that both habits of eating (vegetarian or non-vegetarian) are equally popular in the city at (1) 1% level of significance, (2) 5% level of significance. (8)

(ii) Two samples of sodium vapour bulbs were tested for length of life and the following results were got:

	Size of Sample	Sample Mean	Sample S.D.
Type I	8	1234 hours	36 hours
Type II	7	1036 hours	40 hours

Is the difference in the mean sufficient to generalise that type I is superior to type II regarding length of life? (8)

13. (a) (i) For the following data, use U test at 0.01 level of significance to test the null hypothesis that the two population samples are identical against the alternative hypothesis that on the average the second sample produces a greater gain. (8)

Sample I	16.3	10.1	10.7	13.5	14.9	11.8	14.3	10.2
	12.0	14.7	23.6	15.1	14.5	18.4	13.2	14.0
Sample II	21.3	23.8	15.4	19.6	12.0	13.9	18.8	19.2
	15.3	20.1	14.8	18.9	20.7	21.1	15.8	16.2

(ii) Twenty five individuals were sampled as to whether they like or did not like a product indicated by Y and N respectively. The resulting sample is shown by the following sequence:

YY NNNN YYY N Y NN Y NNNNN YYYYY NN

Test at 5% level of significance whether the responses are random. (8)

(OR)

(b) (i) The strengths of cables made from two different alloys are given in the following table. Using Mann-Whitney U-test, test whether there is a significant difference between the cables at the 5% level. (8)

Alloy I	18.3	16.4	22.7	17.8	18.9	25.3	16.1	24.2		
Alloy II	12.6	14.1	20.5	10.7	15.6	19.6	12.9	15.2	11.8	14.7

(ii) Use the sign test to see if there is a difference between the number of required to collect an account receivable before and after a new collection policy. (8)

Before	33	36	41	32	39	47	34	29	32	34	40	42	33	36	27
After	35	29	38	34	37	47	36	32	30	34	41	38	37	35	28

14. (a) (i) Four farmers each used four types of manures for a crop (area and other considerations are same) and obtained the yields (in quintals) as below:

		Manures			
		1	2	3	4
Farmers	A	22	16	21	12
	B	23	17	19	13
	C	21	14	18	11
	D	22	15	19	10

Is there any significant difference between (i) farmers (ii) Manures. (10)

(ii) Find the mean square Error for a process of growing crystals, temperature and ph influence yield of crystals, a 2² design is attempted and the following results are obtained. (6)

Treatment Combination	Temperature	Ph	Replication 1	Replication 2	Total
(1)	300	2	10	14	24
a	350	2	21	19	40
b	300	3	17	15	32
(ab)	350	3	20	24	44

(OR)

(b) A printing engineer has conducted an experiment on a bottle printing process. The following control factors have been investigated

Factors	Level 1	Level 2
Thickness of printing (A)	0.3mm	0.5mm
Quality of ink (B)	Average	High
Drying of printed bottle (C)	No drying	1 day drying

The experiment was conducted using L_4 OA and the data obtained are given in the below table

Trial no.	Factors/Columns			Results	
	A	B	C	R_1	R_2
1	1	1	1	17	22
2	1	2	2	22	29
3	2	1	2	10	8
4	2	2	1	27	32

1) Determine the average response for each factor level and identify the significant effects (2 factors).

2) What is the predicted bottle printing at the optimum condition? (16)

15. (a) (i) Calculate five-yearly moving averages of number of students studying in a college from the following figures: (8)

Year	1981	1982	1983	1984	1985
No. of Students	332	317	357	392	402
Year	1986	1987	1988	1989	1990
No. of Students	405	410	427	405	438

(ii) Given below are the figures of production (in lakh. kg) of a sugar factory

Year	1971	1972	1973	1974	1975	1976	1977
Production	40	45	46	42	47	50	46

Fit a straight line trend by the least squares method and tabulate the trend. (8)

(OR)

(b) (i) Find the seasonal variations by ratio to trend method from the data given below: (12)

Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1987	34	54	38	38
1988	36	60	52	48
1989	40	58	56	52
1990	52	76	64	58
1991	70	90	88	84

(ii) Draw a trend line by the method of semi-averages from the following data. (4)

Year	1988	1989	1990	1991	1992	1993	1994	1995
Sales	100	105	109	96	102	108	112	114

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