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B.E./B.TECH. (FULL TIME) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2019

(Common to Material Science & Engineering and Printing Technology)

Third Semester

MA8352 – Applied Statistics

(Regulations 2012)

(Use of Statistical table may be permitted)

Time: 3 Hours | Answer ALL Questions | Max. Marks:100

Part A (10 × 2 = 20)

1. Define null hypothesis and alternative hypothesis.
2. A die is thrown 264 times with the following results. Find the value of χ^2.

No. appeared on the die:	1	2	3	4	5	6
Frequency:	40	32	28	58	54	60

3. Write any two uses of non-parametric tests.
4. What are free distribution tests? In what ways are they different from parametric tests?
5. Write the drawbacks of 2^2 factorial design.
6. Compare Randomized Block Design with Latin Square Design.
7. Define Statistical Quality control?
8. 20 pieces of cloth out of different rolls contained respectively 1, 4, 3, 2, 4, 5, 6, 7, 2, 3, 2, 5, 7, 6, 4, 5, 2, 1, 3 and 8 imperfections. Find UCL and LCL.
9. Define secular trend.
10. Fit a trend line to the following data by the method of semi-average

Years	1986	1987	1988	1989	1990	1991	1992
Output (units)	600	800	1000	800	1200	1000	1400

Part B (5 × 16 = 80)

11. (i) 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 YYYY NN
Test at 0.05 significance level whether the responses are random. (8)

(ii) The nicotine contents of two brands of cigarettes, measured in milligrams, was found to be as follows:

Brand A	2.1	4.0	6.3	5.4	4.8	3.7	6.1	3.3		
Brand B	4.1	0.6	3.1	2.5	4.0	6.2	1.6	2.2	1.9	5.4

Test the hypothesis, at the 0.05 level of significance, that the average nicotine contents of the two brands are equal against the alternative that they are unequal. (8)

12. (a) (i) Ten individuals are chosen at random from a population and their heights are found to be in inches 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. In the light of this data, discuss the suggestion that the mean height in the universe is 66 inches. (8)

(ii) In one sample of 8 observations, the sum of the squares of the deviations of the sample values from the sample mean was 84.4 and in other sample of 10 observations it was 102.6. Test whether this difference is significant at 5% level. (8)

(OR)

(b) (i) A die is thrown 9000 times and a throw of 3 or 4 is reckoned as a success. Suppose that 3,240 throws of a 3 or 4 have been made out. Do the data indicate an unbiased die? If not, find the probable limits of probability of getting 3 or 4. (8)

(ii) The following table shows the distribution of goals in a football match.

No. of goals:	0	1	2	3	4	5	6	7
No. of Mistakes	95	158	108	63	40	9	5	2

Fit a Poisson distribution and test the goodness of fit. (8)

13. (a) Analyze the variance in the Latin square of yields (in quintals) of wheat where P, Q, R, S represent the different manures used.

S222	P221	R223	Q222
Q224	R223	P222	S225
P220	Q219	S220	R221
R222	S223	Q221	P222

Test whether the different manures used have given significantly different yields. (16)

(OR)

(b) An industrial engineer has conducted an experiment on a welding process. The following control factors have been investigated

Factors	Level 1	Level 2
Weld material (A)	*SS 41*	SB 35
Type of welding rod (B)	J100	B17
Thickness of weld metal (C)	8mm	12mm
Weld current (D)	130A	150A
Preheating (E)	No	Heating by 100°C
Opening of welding parts (F)	2mm	3mm
Drying of welding rod (G)	No drying	2 days drying

The experiment was conducted using L_8 Orthogonal Array (OA) and the results obtained by two replications are given in the table

	Results							
R1	20	22	39	27	23	10	8	17
R2	17	28	34	37	30	6	7	23

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

(2) What is the predicted weld strength at the optimum condition? (16)

14. (a) (i) The following data give 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)

(ii) Control on measurements of pitch diameter of thread in air-craft fittings is checked with 5 samples each containing 5 items at equal intervals of time. The measurements are given below. Construct $\bar{X}$ and R charts and state your inference from the charts. (10)

Sample No.	Measurements				
1	46	45	44	43	42
2	41	41	44	42	40
3	40	40	42	40	42
4	42	43	43	42	45
5	43	44	47	47	45

(OR)

(b) (i) The following data refers to visual digits found during the inspection of the first 10 samples of size 50 each from a lot of two-wheelers manufactured by an automobile company. Draw a p-chart to show that fraction defectives are under control. (6)

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of defects	4	3	2	3	4	4	4	1	3	2

(ii) The data given below are the number of defectives in 10 samples of size 400 each. Construct a p-chart and np-chart and comment on the results. (10)

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of defectives	15	12	4	26	15	9	19	9	14	17

15. (a) (i) The following table shows the average monthly production of coal in millions of tonnes for the year 1987-1996. Determine (1) 4-yearly moving average figures; (2) 4-yearly centered moving average. Also write the trend values. (10)

Year	Average monthly production of coal (In million tonnes)	Year	Average monthly production of coal (In million tonnes)
1987	50.0	1992	38.1
1988	36.5	1993	32.6
1989	43.0	1994	41.7
1990	44.5	1995	41.1
1991	38.9	1996	33.8

(ii) Calculate 5-year weighted moving averages for the following data, using the weights 1, 1, 3, 2, 1 respectively: (6)

Years	1	2	3	4	5
Coded Sales	40	33	72	81	76

(OR)

(b) Compute seasonal indices by Ratio to Moving Average Method from the following : (16)

Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1971	75	60	54	59
1972	86	65	63	80
1973	90	72	66	85
1974	100	78	72	93

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