Q. Code:649951

Reg. No. | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATION, MAY 2024

Sixth Semester

OM18001 –STATISTICAL METHODS FOR ENGINEERS

(Common to AE, AI & DS, CS, CH, EE, EC, IT and ME)

(Regulation 2018 / Regulation 2018A)

Use of statistical tables are permitted

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 The students will have a fundamental knowledge of the concepts of descriptive statistics.

CO 2 The students will have a notion of sampling distributions and to analyse and interpret the data based on the large sample tests.

CO 3 Understand and characterize phenomena about variance and proportion and Goodness of fit.

CO 4 Students would be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.

CO 5 To enable the students to know the concepts of statistical Quality control theory and their applications on real time problems.

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Find the median for the following data:	**1**	**2**

x	3	6	9	12	13	15	21	22
f	3	4	5	2	4	5	4	3

2.	Examine whether the following results of a piece of computation for obtaining the second central moment are consistent or not: $N=120, \sum fx=-125, \sum f x^2=128.$	**1**	**2**
3.	A manufacturer claimed that at least 98% of the steel pipes which he supplied to a factory conformed to specifications. An examination of a sample of 500 pieces of pipes revealed that 30 were defective. Calculate Z – value.	**2**	**2**
4.	Define Type – I error and Type – II error in testing of hypothesis.	**2**	**1**
5.	The average numbers of articles produced by two machines per day are 200 and 250 with standard deviations 20 and 25 respectively on the basis of records of 25 days production. Determine the standard error between two sample means.	**3**	**2**
6.	Write any two applications of Chi-square test.	**3**	**1**
7.	Construct a table for one-way classification in analysis of variance.	**4**	**2**
8.	What are the basic principles of experimental design?	**4**	**1**
9.	What are the control charts for attributes?	**5**	**1**
10.	If the average fraction defective of a large sample of products is 0.1537, calculate the control limits. (Given that sub-group size is 2,000)	**5**	**2**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	If the median of the distribution given below is 28.5, find the values of $x \wedge y$.	**(7)**	**1**	**3**

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	Total
Frequency	5	x	20	15	y	5	60

(ii)	Calculate the quartile deviation and coefficient of quartile deviation from the following data:					**(7)**	**1**	**3**

Age in years	20	30	40	50	60	70	80
Number of Members	3	61	132	153	140	51	3

(OR)

(b)	Calculate Karl Pearson's Coefficient of Skewness from the data given below:					**(14)**	**1**	**3**

Hourly wages(Rs.)	No. of workers	Hourly wages(Rs.)	No. of workers
40-50	5	90-100	30
50-60	6	100-110	36
60-70	8	110-120	50
70-80	10	120-130	60
80-90	25	130-140	70

12. (a)	**(i)**	The means of two single large samples of 1,000and 2,000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? (Test at 5% level of significance)	**(7)**	**2**	**3**
	(ii)	Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same against that they are not, at 5% level.	**(7)**	**2**	**3**

(OR)

(b)	**(i)**	In a survey of buying habits, 400 women's shoppers are chosen at random in super market 'A' located in a certain section of the city. Their average weekly food expenditure is Rs. 250 with a standard deviation of Rs. 40. For 400 women shoppers chosen at random in super market 'B' in another section of the city, the average weekly food expenditure is Rs. 220 with a standard deviation of Rs. 55. Test at 1% level of significance whether the average	**(7)**	**2**	**3**

weekly food expenditure of the two populations of shoppers are equal.

(ii) In a sample of 300 units of a manufactured product, 65 units were found to be defective and in another sample of 200 units, there were 35 defectives. Is there significant difference in the proportion of defectives in the samples at the 5% level of significance? **(7) 2 3**

13. (a) (i) The following data shows the cost in hundred rupees per square meter of the floor area concerning randomly selected 7 schools and 5 office blocks from those completed during the period 1997 to 2002. **(7) 3 3**

Schools	28	31	26	27	23	38	37
Office blocks	37	42	34	37	35	-	-

Do the data support the hypothesis that the cost per square meter for the office blocks was greater than that for the schools? Test at 5% level of significance.

(ii) A sample analysis of examination results of 500 students was made. It was found that 180 students has failed, 170 had secured a third class, 110 were placed in second class and 40 got a first class. Are these figures commensurate with the general examination result which is in the ratio of 4:3:2:1 for the various categories respectively? **(7) 3 3**

(OR)

(b) (i) Two random samples of sizes 9 and 6 gave the following values of the variable. **(7) 3 3**

Sample 1	15	22	28	26	18	17	29	21	24
Sample 2	8	12	9	16	15	10	-	-	-

Test whether there is any significance difference between the population variances at 5% level of significance.

(ii) Calculate the expected frequencies for the following data presuming the two attributes, viz., conditions of home and condition of child as independent **(7) 3 3**

		Condition of home	
		Clean	Dirty
Condition of child	Clean	70	50
	Fairly clean	80	20
	Dirty	35	45
	Total	185	115

Use Chi-square test 5% level of significance to state whether the two attributes are independent.

14. (a) The following data represent the number of units of a product produced by 3 different workers using 3 different types of machines. **(14) 4 3**

Workers	Machines		
	A	B	C
X	8	32	20
Y	28	36	38
Z	6	28	14

Test (i) whether the mean productivity is the same for the different machine types, and (ii) whether the three workers differ with respect to mean productivity

(OR)

(b) Analyses the following results of a Latin square experiments. The letters A, B, C, D denote the treatments and the figures in brackets denote the observations. **(14) 4 3**

A (12)	D (20)	C (16)	B (10)
D (18)	A (14)	B (11)	C (14)
B (12)	C (15)	D (19)	A (13)
C (16)	B (11)	A (15)	D (20)

15. (a) Given below are the values of sample mean $\bar{X}$ and sample range R for 10 samples, each of size 5. Draw the appropriate mean and range charts and comment on the state of control of the process. **(14) 5 3**

Mean	43	49	37	44	45	37	51	46	43	47
Range	5	6	5	7	7	4	8	6	4	6

(OR)

(b) 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. **(14) 5 3**

Sample Number	1	2	3	4	5	6	7	8	9	10
Number of defective	6	16	7	3	8	12	7	11	11	4

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

	Marks	CO	RBT LEVEL
16. Suppose 3 drying formulas for curing a glue are studied and the following times observed.	**(10)**	**4**	**3**

Formula A	13	10	8	11	8	-
Formula B	13	1	14	14	-	-

		1				
Formula C	4	1	3	4	2	4

Perform an analysis of variance to test at the 0.05 level of significance whether the differences among the sample means at the 3 formulas are significant.

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