(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0639 Roll No.

B.Tech.

(SEMESTER-III) THEORY EXAMINATION, 2012-13

STATISTICAL TECHNIQUES

Time : 3 Hours] *[Total Marks : 100*

Note : Attempt **all** questions. Provide the statistical tables which are required to students.

SECTION – A

1. Attempt **all** parts of this question : **2 × 10 = 20**

(a) Define the Histogram.

(b) The mean age of a group of 100 persons was found to be 32.02. Later, it was discovered that age 57 was misread as 27. Find the correct mean.

(c) For a distribution Bowley's coefficient of skewness is – 0.36, $Q_1 = 8.6$ and median = 12.3. What is the quartile coefficient of dispersion ?

(d) It is known that mean and median of a distribution are 3.0 and 4.0. Is the distribution skewed ?

(e) The two lines of regression for a bivariate distribution are $3x + 2y = 7$ and $x + 4y = 9$. Find the regression coefficients b_{yx} and b_{xy}.

(f) Find the normal equations of $y = ae^{bx}$.

(g) In how many ways can the letters of the word 'statistics' be arranged.

(h) In a Poisson distribution, the probability $P(x)$ for $x = 0$ is 10%. Find the mean of the distribution.

(i) A coin was tossed 400 times and the head turned up 216 times. Test the hypothesis that coin is unbiased.

(j) Define Non-Parametric Tests.

SECTION – B

2. Attempt any **three** parts of this question : $3 \times 10 = 30$

(a) Following is the distribution of students according to their height and weight :

Weight/Height	90-100	100-110	110-120	120-130
50-55	4	7	5	2
55-60	6	10	7	4
60-65	6	12	10	7
65-70	3	8	6	3

Calculate (i) the two coefficients of regression, (ii) obtain the two regression lines, and (iii) coefficient of correlation.

(b) Find the mean and standard deviation of the Poisson distribution and also show that mean and variance of Poisson distribution are equal.

(c) Apply the $\chi 2$-test of goodness of fit for the two series (a) and (b).

(a)	1	12	66	220	495	792	924	792	495	222	66	12	1
(b)	2	15	66	210	484	799	943	799	484	210	66	15	1

The value of $\chi 2$ for 8 degrees of freedom at 5% level of significance is 15.50.

(d) Twenty four applicants for a position are interviewed by three administrators and rated on a scale of 5 as to suitability for the position. Each applicant is given a "suitability" score which is the sum of the three numbers. Although college education is not a requirement for the position, a personnel director felt that it might have some bearing on suitability for the position. Raters made their rating on the basis of individual interviews and were not told the educational background of the applicants. Twelve of the applicants had completed at least two years of college. Use the Mann Whitney U-test to determine whether there was a difference in the scores of the two groups. Use a 0.05 level of significance. Group A had an educational background of less than two years of college, while group B had completed at least two years of college.

"Suitability Scores"

Group A	7	11	9	4	8	6	12	11	9	10	11	11
Group B	8	9	13	14	11	10	12	14	13	9	10	8

(e) The following table gives the number of units of production per day turned out by four different types of machines :

	M_1	M_2	M_3	M_4
E_1	40	36	45	30
E_2	38	42	50	41
E_3	36	30	48	35
E_4	46	47	52	44

Using analysis of Variance (i) test the hypothesis that mean production is the same for the four machines, and (ii) test the hypothesis that the employees do not differ with respect to mean productivity.

SECTION – C

Attempt any **two** parts from each question of this section : **5 × 2 × 5 = 50**

3. (a) The first four moments of a distribution about $x = 4$ are 1, 4, 10 and 45. Obtain the various characteristics of the distribution on the basis of the information given. Comment upon the nature of the distribution.

(b) The A.M. of 5 observations is 4.4 and the variance is 8.24. If 3 of the 5 observations are 1, 2 and 6, find the other two.

(c) Calculate the Karl Pearson's coefficient of skewness from the following data :

Marks	Above 0	Above 10	Above 20	Above 30	Above 40	Above 50	Above 60	Above 70	Above 80
No. of Students	150	140	100	80	80	70	30	14	0

4. (a) The odds against A, solving a problem, are 7 : 5 and the odds in favour of B solving it are 12 : 9. What is the probability that if both of them try it, it will be solved ?

(b) The sum and product of the mean and variance of a binomial distribution are 24 and 128 respectively. Find the distribution.

(c) The scores of candidates in a certain test are normally distributed, with mean 500 and standard deviation 100. What percentage of candidates receives the scores between 350 and 550 ?

5. (a) If x and y are two uncorrelated variables and $u = x + y$, $v = x - y$, find the coefficient of correlation between u and v in terms of σ_x and σ_y.

(b) Show that the regression coefficients are independent of the change of origin but not of scale.

(c) Using the method of least square, fit the curve of the form $y = a + bx^2$ to the following data :

x	– 1	0	1	2
y	2	5	3	0

6. (a) Intelligence tests of two groups of boys and girls give the following result. Examine if the difference is significant.
Girls : Mean = 84, S.D. = 10, Number = 121.
Boys : Mean = 81, S.D. = 12, Number = 81.

(b) In a sample of 8 observations, the sum of squared deviations of items from the mean was 84.4. In another sample of 10 observations, the value was found to be 102.6. Test whether the difference is significant at 5% level of significance.

(c) Write short note on Hypothesis testing.

7. (a) Write the steps in constructing of Latin square.

(b) The following data relate to the daily production of cement (in m. tones) in a large plant for 30 days :

11.5	10.0	11.2	10.0	12.3	11.1	10.2	9.6	8.7	9.3
9.3	10.7	11.3	10.4	11.4	12.3	11.4	10.2	11.6	9.5
10.8	11.9	12.4	9.6	10.5	11.6	8.3	9.3	10.4	11.5

Use sign test the null hypothesis that plant's average daily production of cement is 11.2 m. tones against hypothesis $u < 11.2$ m. tones at the 0.05 level of significance.

(c) Write the advantages of Non-Parametric tests.

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