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Your Roll No...........................

6361

B.Sc. (Hons.) III Sem./II Yr./NS $\left(\widehat{H}\right)$

COMPUTER SCIENCE

Paper 304 : STATISTICS

(Admissions of 2001 and onwards)

Time : 3 *Hours*   *Maximum Marks* : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

All questions are compulsory.

Use of scientific calculator and statistical table

is allowed in examination.

All questions carry equal marks.

1. Find the missing frequencies and mode of the following incomplete frequency distribution for which total frequency is 1000 and the median is 413.13

Wages (in Rs.) (x)	**Frequency**
300—325	5
325—350	17

P.T.O.

350—375	80
375—400	?
400—425	325
425—450	?
450—475	88
475—500	9

2. A person was asked to calculate the mean and s.d. of 50 observations. He noticed that 4 of the 50 observations were zeros and hence ignored them and calculated the mean and s.d. of the remaining 46 observations as 42.96 and 13.8812. Find the correct valued of mean and s.d. of the 50 observations.

3. In a certain distribution the coefficients of skewness based on quartiles is 0.6. If the sum of the third and first quartile is 100 units and the median is 38 units, find the first and third quartiles.

4. For a bivariate data, the two lines of regression are : $y = 160 + 1.3x$ and $x = 4 + 0.4y$. Determine $\bar{x}, \bar{y}, r_{xy}$ and S_x/S_y where S_x is the s.d. of x and S_y is that of the variable y.

∝ (5.) If r_{12} = K and r_{23} = −K, then show that r_{13} will lie between −1 and $1 - 2K^2$.

6. Ten competitors in a musical test were ranked by the three judges A, B and C in the following order.

Rank A	Rank B	Rank C
1	3	6
6	5	4
5	8	9
10	4	8
3	7	1
2	10	2
4	2	3
9	1	10
7	6	5
8	9	7

Using rank correlation method, discuss which pair of judges has the nearest approach to common liking in music.

P.T.O.

7. The amount of time that a drive-through bank teller spends on a customer is a random variable with a mean $\mu = 3.2$ minutes and the standard deviation $\sigma = 1.6$ minutes. If the random sample of 64 customers is observed, find the probability that their mean time at the teller counter is :

(a) at most 2.7 minutes;

(b) more than 3.5 minutes.

8. A chemical engineer claims that the population mean yield of a certain batch process is 500 grams per milliliter of raw material. To check this claim he samples 25 batches each month. If the computed t-value falls between $-t_{0.05}$ and $t_{0.05}$, he is satisfied with his claim. What conclusion should he draw from a sample that has a mean $\bar{x} = 518$ grams per milliliter and a sample standard deviation $S = 40$ grams ? Assume the distribution of yields to be approximately normal.

9. The lives of a certain automobile seal have the Weibull distribution with failure rate $Z(t) = \frac{1}{\sqrt{t}}$. Find the probability that such a seal is still in use after 4 years.

10. An experiment was performed to compare the abrasive wear of two different laminated materials. Twelve pieces of material 1 were tested by exposing each piece to a machine measuring wear. Ten pieces of material 2 were similarly tested. In each case, the depth of wear was observed. The samples of material 1 gave an average (coded) wear of 85 units with a sample standard deviation of 4, while the sample of material 2 gave an average of 81 and a sample standard deviation of 5. Can we conclude at the 0.05 level of significance that the abrasive wear of material 1 exceeds that of material 2 by more than 2 units ? Assume the populations to be approximately normal with equal variable.

11. A coin is thrown until a head occurs and the number X of tosses recorded. After repeating the experiment 256 times, we obtained the following results :

x	f
1	136
2	60

P.T.O.

3	34
4	12
5	9
6	1
7	3
8	1

Test the hypothesis at the 0.05 level of significance that the observed distribution of X may be fitted by the geometric distribution $g(x; 1/2)$ $x = 1, 2, 3, \ldots$.

12. Show that if $\mu_{y/x}$ is linear in x and var(y/x) is constant, then var$(y/x) = \sigma_2^2(1 - \rho^2)$.

13. Given the joint density :

$$f(x, y) = \begin{cases} 24xy & ; \quad x > 0, y > 0, x + y < 1 \\ 0 & ; \qquad \text{elsewhere} \end{cases}$$

find the regression equation $\mu_{Y/X}$, of the variable Y on the variable X.

14. If X_1, X_2 and X_3 constitute a random sample of size $n = 3$ from a Bernoulli population; show that $Y = X_1 + 2X_2 + X_3$ is not a sufficient estimator of θ.

15. If

$$\hat{\theta}_1 = \frac{X}{n}, \quad \hat{\theta}_2 = \frac{X + 1}{n + 2} \text{ and } \hat{\theta}_3 = \frac{1}{3}$$

are estimator of the parameter θ of a binomial population and $\theta = 1/2$, for what values of n the mean square error of $\hat{\theta}_2$ less than the variable of $\hat{\theta}_1$.