6190

B.Sc. (Hons.) III Sem. / II Yr.   J
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)
Attempt **all** questions.
All questions carry equal marks

Use of scientific calculator and statistical table is allowed in the examination

1   For a certain frequency table with total frequency 1,000, the median was found to be 413 13. But while copying out the table, a typist left out two of the class frequencies, say f* and f**, so that the table is in the form ·

Wages in Rs	300-324	325-349	350-374	375-399
Frequency	5	17	80	f*
Wages in Rs.	400-424	425-449	450-474	475-449
Frequency	325	f**	88	9

Determine f* and f** and the mode

2   For a certain frequency distribution, the following data is given

Mean = 164 734 cm.   Mode = 164.836

First quartile = 160.951 cm.   Median = 164.758 cm.

Third quartile = 168.446 cm.   S D = 5.472 cm

Calculate Bowley's and Pearson's (first and second) measures of skewness.

What can you say about the skewness of this distribution ? Can you find out the kurtosis of this distribution ? Justify your answer.

3   Calculate the first four moments of the following distribution about the mean and hence find b_1 and b_2 :

X	0	1	2	3	4	5	6	7	8
F	1	8	28	56	70	56	28	8	1

4   Following is the distribution of the marks obtained by 500 candidates in Statistics paper of a civil services examination :

Marks more than	0	10	20	30	40	50
No. of candidates	500	460	400	200	100	30

Calculate the lower quartile marks If 70% of the candidates pass in the paper, find the minimum marks obtained by the pass candidate

5   (a)   The correlation coefficient between a general intelligence test and school achievement in a group of children of age from 8 to 14 years is 0 80 The correlation between the general intelligence test and the age in the same group is 0.70 and the correlation between school achievement and the age is 0 60 Find the correlation between general intelligence and the school achievement in children of the same age ?

    (b)   Suppose for a given set of values of X_1, X_2 and X_3, the following information is available

$$r_{12} = 0\ 91, r_{13} = 0.33 \text{ and } r_{23} = 0\ 81$$

Explain whether these computations can be said to be free from errors

6   If $\overline{X_1}$ and $\overline{X_2}$ are the means of independent random samples of size n_1 and n_2 from a normal population with the mean μ and variance σ^2, show that the variance of the unbiased estimator $\omega\ \overline{X_1} + (1 - \omega)\ \overline{X_2}$ is a minimum when

$$\omega = \frac{n_1}{n_1 + n_2}$$

7   In a partially destroyed laboratory, record of an analysis of correlation data, the following results were only legible
Variance of $X = 9$, Regression equations
$8x - 10y + 66 = 0$, $40x - 18y = 214$.
Calculate (a) the mean values of X and Y (b) the correlation between X and Y and (c) the standard deviation of Y

8　(a)　If a random sample is drawn from a normal population such that the sample mean and the population mean are known but variance is known only for the sample, then to test the significance of the mean, which distribution should be used ?

　　(b)　Given a random sample of size 24 from a normal distribution, find k such that

　　　(i)　$P(-2\,069 < T < k) = 0\,965$

　　　(ii)　$P(-k < T < k) = 0\,90$

　　　where T is the random variable having t distribution

9　Define Weibull distribution for a continuous variable X. Obtain its mean and variance

10　If $x_1, x_2, \quad , x_n$ are the values of a random sample from $U(0, \beta)$, find the maximum likelihood estimator of β

11.　The weights in gms of a number of copper wires, each of length one metre, were obtained These are shown below classified according to the die from which they have come Determine the intra-class correlation and interpret the result obtained

	Die No.			
I	II	III	IV	V
1 33	1.30	1 32	1 31	1 30
1 32	1 35	1 29	1 29	1 32
1.36	1 33	1 31	1 33	1 33
1 35	1.34	1 28	1.31	1.33

12 The grades in a statistics course for a particular semester are as follows .

Grade	A	B	C	D	E
F	14	18	32	20	16

Test the hypothesis at 5% level of significance that the distribution of grades is uniform

13 If the joint density of X_1, X_2 and X_3 is given by

$$f(x_1, x_2, x_3) = \begin{cases} (x_1 + x_2) \exp(-x_3) & \text{for } 0 < x_1 < 1, 0 < x_2 < 1, 0 < x_3 \\ 0 & \text{elsewhere.} \end{cases}$$

Find the regression equation of X_2 on X_1 and X_3.

14 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 the other sample of 10 observations it was 102.6 Test whether this difference is significant at 5% level.

15 Pull strength tests on 10 soldered leads for a semi conductor device yield the following results, in pounds, force required to rupture the bond

  19 8, 12 7, 13 2, 16 9, 10 6, 18 8, 11 1, 14 3, 17 0, 12.5

Another set of 8 leads was tested after encapsulation to determine whether the pull-strength has been increased by encapsulation of the device, with the following results

  24 9, 22 8, 23 6, 22 1, 20 4, 21 6, 21.8, 22 5

Comment on the evidence available concerning equality of the two population variances

___