

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY
 End Term Examination, Nov-Dec 2024
 B. Tech., Odd Semester, 2024-25

Roll No.

AS1117: Probability and Statistics

Time: 2.5 hours

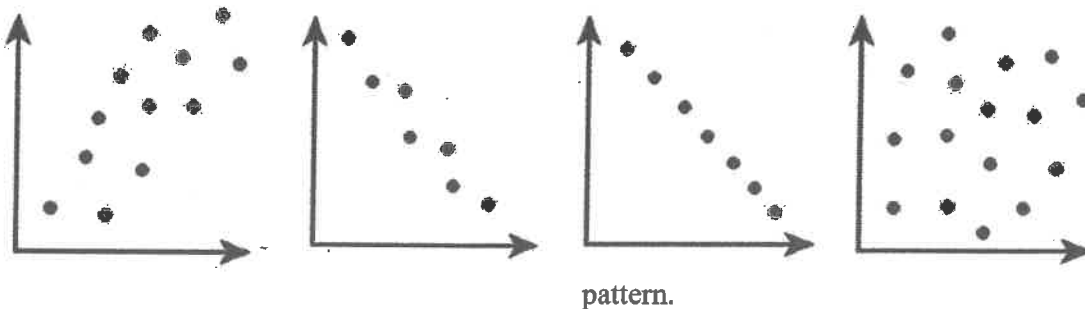
Max. Marks: 30

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. You may use non-programmable scientific calculator.
3. Unless specified, perform all the calculations till **4 decimal places with rounding**.

- Q. 1 a) Given four values of correlation coefficients $r = 0, 0.5, -0.9, -1$ and four scatterplots, assign each scatterplot a value of r that best represents its correlation

1
(CO5)



- b) Given the following data, determine the correlation between IQ scores X , and statistics exam scores Y .

2
(CO5)

Student:	1	2	3	4	5	6	7	8	9	10
IQ score X :	140	98	105	120	119	114	102	112	111	116
Stats score Y :	47	32	38	40	40	43	33	47	46	44

Given: $\sum X_i = 1137$, $\sum Y_i = 410$, $\sum X_i^2 = 130511$, $\sum Y_i^2 = 17076$, and, $\sum X_i Y_i = 47008$.

- Q. 2 The following table shows how many days in November a sample of 6 students were present at their university and the number of lectures each attended on a given day.

3.5+1+1.5
(CO5)

Number of Days present x	Number of Lectures attended y
12	3
8	2
13	5
10	4
7	1
10	3

- a) Find the equation of the least squares regression line to predict y in terms of x .
- b) Using the regression equation, estimate how many lectures a student who has been present for 15 days is expected to attend each day.
- c) Compute the Sum of Squares for Error (SSE) for the given data.

Q. 3	Independent random samples of sizes 30 and 55 were taken from two normal populations, which are assumed to have a common variance of 17.6. The sample means were found to be 23.0 and 21.9, respectively. Test at 1% significance level whether the two populations have the same mean, using hypothesis for difference of means.	3 (CO3,4)																		
Q. 4	An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed, with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a random sample of 16 bulbs will have an average life of less than 775 hours.	3 (CO3,4)																		
Q. 5	a) The dean of a college wants to use the mean of a random sample to estimate the average amount of time students take to get from one class to the next, and she wants to be able to assert with 99% confidence that the error is at most 0.25 minute. If it can be presumed from experience that $\sigma = 1.40$ minutes, how large a sample will she have to take? b) A researcher collects data on children's weights from a random sample of children in the South and concludes that children in the South weigh less than the national average. The researcher, however, does not realize that the sample includes many children who are small for their age and that in reality there is no difference in weight between children in the South and the national average. What type of error is the researcher making?	3 + 1 (CO3,4)																		
Q. 6	The producers of a new toothpaste claim that it prevents more cavities than other brands. A random sample of 60 people used the new toothpaste for 6 months and their mean number of cavities at their next checkup was recorded as 1.5. In the general population, the mean number of cavities at a 6-month checkup is 1.73. a) Define the null hypothesis H_0 and the alternate hypothesis H_a for this study. b) Identify the appropriate test statistic to use and explain why it is suitable. c) Perform the hypothesis test at the 5% significance level. Should H_0 be rejected? What should the researcher conclude? d) Determine the 95% confidence interval for the population mean based on the sample mean.	4 + 2 (CO3,4)																		
Q. 7	A test was given to five randomly selected students from class 10 th of three different schools in a town. The individual scores of the students are as follows: <table><tr><td>School 1:</td><td>77</td><td>81</td><td>71</td><td>76</td><td>80</td></tr><tr><td>School 2:</td><td>72</td><td>58</td><td>74</td><td>66</td><td>70</td></tr><tr><td>School 3:</td><td>76</td><td>85</td><td>82</td><td>80</td><td>77</td></tr></table> Using a one-way analysis of variance (ANOVA), test at the 0.01 level of significance whether there is a statistically significant difference in the mean scores of the students among these schools.	School 1:	77	81	71	76	80	School 2:	72	58	74	66	70	School 3:	76	85	82	80	77	5 (CO3,4)
School 1:	77	81	71	76	80															
School 2:	72	58	74	66	70															
School 3:	76	85	82	80	77															

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