

JK Lakshmi Pat University, Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2026

B. Tech., Even Semester, 2025-26

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 a calculator and statistical tables.
3. Specify if you find any ambiguity in the questions. Justify and solve the question after removing that ambiguity.

Q. 1	A nutritionist wants to examine whether a newly developed energy supplement improves the average reaction speed of athletes. The known mean reaction time without the supplement is 2.4 seconds. A sample of 64 athletes who consumed the supplement showed a mean reaction time of 2.2 seconds with a sample standard deviation of 0.48 seconds. Using a suitable statistical test, determine whether the supplement has significantly affected the reaction time. Use $\alpha = 0.05$.	3.0 (CO4)																									
Q. 2	The following contingency table shows the relationship between preferred mode of transport and residential area of employees in a company. Compute the value of χ^2 and test whether there is an association between the two attributes. (Given: $\alpha = 0.05$) <table border="1"><thead><tr><th>Residential Area</th><th>Bus</th><th>Car</th><th>Bike</th><th>Total</th></tr></thead><tbody><tr><td>Urban</td><td>18</td><td>22</td><td>20</td><td>60</td></tr><tr><td>Semi-Urban</td><td>20</td><td>15</td><td>25</td><td>60</td></tr><tr><td>Rural</td><td>12</td><td>8</td><td>10</td><td>30</td></tr><tr><td>Total</td><td>50</td><td>45</td><td>55</td><td>150</td></tr></tbody></table>	Residential Area	Bus	Car	Bike	Total	Urban	18	22	20	60	Semi-Urban	20	15	25	60	Rural	12	8	10	30	Total	50	45	55	150	6.0 (CO2,4)
Residential Area	Bus	Car	Bike	Total																							
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Q. 3	The weights of 2000 students in a university are normally distributed with mean 68 kg and standard deviation 7 kg. Estimate how many students have weight less than 60 kg.	3.0 (CO3)																									
Q. 4	Given, $S_{xy} = 13, S_{xx} = 10, S_{yy} = 26, \bar{x} = 3, \bar{y} = 5$; find regression coefficients b_{y_x} and b_{x_y}. Hence, find the correlation coefficient.	2.0 + 1.0 (CO5)																									
Q. 5	An undesirable effect of some antihistamines is drowsiness, which is a consequence of the effect of the drugs on the central nervous system. These data come from an experiment of Hedges, Hills, Maclay, Newman-Taylor and Turner (1971) to compare the effect on the central nervous system of a placebo and two antihistamines. This was done by measuring the flicker frequency sometime after drug administration in four volunteers who have taken the three treatments. The data presented here are scaled measures based on the flicker frequency. <table border="1"><thead><tr><th>Subject Number</th><th>Meclastine</th><th>Promethazine</th><th>Placebo</th></tr></thead><tbody><tr><td>1</td><td>112</td><td>112</td><td>131</td></tr><tr><td>2</td><td>48</td><td>37</td><td>61</td></tr><tr><td>3</td><td>106</td><td>93</td><td>112</td></tr><tr><td>4</td><td>51</td><td>46</td><td>70</td></tr></tbody></table> Carry out analysis of variance to examine whether there is a difference between the effects of the different drugs, clearly stating your hypotheses, conclusions and any assumptions made ($\alpha = 0.05$).	Subject Number	Meclastine	Promethazine	Placebo	1	112	112	131	2	48	37	61	3	106	93	112	4	51	46	70	6.0 (CO2,4)					
Subject Number	Meclastine	Promethazine	Placebo																								
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Q. 6	A manufacturer claims that the standard deviation of the lifetime of its LED bulbs is 120 hours. A random sample of 50 bulbs gives a sample standard deviation of 105 hours. Test the null hypothesis $\sigma = 120$ hours against the alternative hypothesis $\sigma \neq 120$ hours at the 0.05 level of significance.	3.0 (CO3,4)
Q. 7	A random sample of size 81 is taken from a population with known standard deviation $\sigma = 4.5$. If the sample means are 52.3, construct a 95% confidence interval for the population mean μ.	3.0 (CO3,5)
Q. 8	A software company receives 75% of its technical support requests through an outsourced call center, and 12% of these requests lead to customer dissatisfaction. The remaining 25% requests are handled by in-house staff, and only 4% of these lead to dissatisfaction. a) Find the probability that a randomly selected request results in customer dissatisfaction. b) If a customer is dissatisfied, find the probability that the request was handled by the outsourced call center.	3.0 (CO1)