JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech. -IV Semester (BI)

COURSE CODE (CREDITS): 18B11MA411 (3) MAX. MARKS: 25

COURSE NAME: BIOSTATISTICS

COURSE INSTRUCTORS: Saurabh Srivastava MAX. TIME: 1 Hour 30 Min

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Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

(c) Use of scientific calculator is allowed.

<table>
<tr><th>Q. No.</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>Q1</td><td>A company is to replace its fleet of cars. Eight possible models are considered and the transport manager is asked to rank them, from 1 to 8, in order of preference. A saleswoman is asked to use each type of car for a week and grade them according to their suitability for the job (A-very suitable to E-unsuitable). The price is also recorded in the following table:
<table>
<tr><th>Model</th><th>Transport manager's ranking</th><th>Saleswoman's grade</th><th>Price(£10's)</th></tr>
<tr><td>S</td><td>5</td><td>B</td><td>611</td></tr>
<tr><td>T</td><td>1</td><td>B+</td><td>811</td></tr>
<tr><td>U</td><td>7</td><td>D-</td><td>591</td></tr>
<tr><td>V</td><td>2</td><td>C</td><td>792</td></tr>
<tr><td>W</td><td>8</td><td>B-</td><td>520</td></tr>
<tr><td>X</td><td>6</td><td>D</td><td>573</td></tr>
<tr><td>Y</td><td>4</td><td>C+</td><td>683</td></tr>
<tr><td>Z</td><td>3</td><td>A-</td><td>716</td></tr>
</table>
Calculate Spearman's rank correlation coefficient between:
a) Price and the transport manager's rankings.
b) Price and the saleswoman's grades.</td><td>1</td><td>5</td></tr>
<tr><td>Q2</td><td>Suppose that a laboratory test to detect a certain disease has the following statistics. Let
A = event that the tested person has the disease, and
B = event that the test result is positive.
It is known that $P(B|A) = 0.99$ and $P(B|\bar{A}) = 0.005$, and 0.1 percent of the population actually has the disease. What is the</td><td>2</td><td>3</td></tr>
</table>

	probability that a person has the disease given that the test result is positive?		
Q3	It is conjectured that an impurity exists in 28% of all water dispensers in a hostel of a medical college. To gain some insight into the true extent of the problem, it is determined that some testing is necessary. It is too expensive to test all the dispensers in the hostel, so 12 are randomly selected for testing. **a)** What is the probability that exactly 3 dispensers have the impurity? **b)** What is the probability that more than 3 dispensers have impurity?	**2**	**4**
Q4	The amount of time that a watch will run without having to be reset is a random variable having an exponential distribution with a mean time of 120 days. Find the probabilities that such a watch will have to be reset in less than 24 days.	**2**	**4**
Q5	Suppose that during periods of meditation, the reduction of a person's oxygen consumption is a random variable having a normal distribution with $\mu = 37.6$ cc per minute and $\sigma = 4.6$ cc per minute. Find the probabilities that during a period of meditation, a person's oxygen consumption will be reduced by anywhere from 30.0 to 40.0 cc per minute.	**2**	**4**
Q6	**a)** Make a table to explain type I and type II errors. **b)** Explain the difference between one-tailed and two-tailed tests through diagrams. **c)** What is the p-value?	**3**	**2+2+1**

Cumulative Standardized Normal Distribution:

−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0722	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776