

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION-2022

M.Tech.-I Semester (CSE), Ph.D.

COURSE CODE (CREDITS): 22M11MA111 (3)

MAX. MARKS: 25

COURSE NAME: Mathematical Foundations for Data Science

COURSE INSTRUCTORS: SST

MAX. TIME: 1 Hour 30 Min

Note: All questions are compulsory. Marks are indicated against each question in square brackets. Use of calculator is allowed.

Q1. The temperature at a point (x, y) on a metal plate is $T(x, y) = 4x^2 - 4xy + y^2$. An ant on the plate walks around the circle of radius 5 centered at the origin. What are the highest and lowest temperatures encountered by the ant? **[4](CO-1)**

Q2. The probability that a missile hits a target is 0.6. If missiles are fired independently at a target until it is hit, what is the probability that it takes more than four missiles to hit the target? **[2](CO-3)**

Q3. E-mails arrive at an account in a Poisson manner at an average rate of five per hour. Find the probability for each of the following events:

- a) Exactly three emails arrive within one hour.
- b) No email arrives within one hour.
- c) At least three emails arrive within one hour.

[4](CO-3)

Q4. The mean lifetime of a sample of 100 light bulbs produced by Lighting Systems Corporation is computed to be 1570 hours with a standard deviation of 120 hours. If the president of the company claims that the mean lifetime of all the light bulbs produced by the company is 1600 hours, test the hypothesis that mean lifetime is not equal to 1600 hours using a level of significance of 0.05. **[4](CO-3)**

Q5. The following data were collected to determine the relationship between pressure and the corresponding scale reading for the purpose of calibration.

Pressure, x (lb/sq in.)	10	10	10	10	10	50	50	50	50	50
Scale Reading, y	13	18	16	15	20	86	90	88	88	92

Find the equation of the regression line for scale reading. Estimate the scale reading for pressure 30 lb/sq in. **[4](CO-3)**

[P.T.O.]

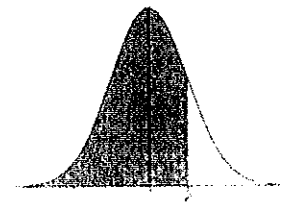
Q6. An electrical firm manufactures light bulbs that have a life, before burn-out, that is normally distributed with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a bulb burns between 778 and 834 hours. [4](CO-3)

Q7. The following table represents each individual's weight and corresponding blood pressure. Calculate the Karl Pearson's correlation coefficient between weight and blood pressure. Also interpret the result.

Person	Weight (Pounds)	Blood Pressure (mmHg)
A	150	125
B	169	130
C	175	160
D	180	169
E	200	150

[3](CO-3)

Standard Normal Cumulative Probability Table



Cumulative probabilities for POSITIVE z-values are shown in the following table:

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389