| Name of Examination | Continuous Assessment Test 2 (CAT 2), Winter Semester 2023-24 | | | |
|---|---|---|---|---|
| Slot: D1+TD1 | Course Mode: Class Based Learning | | Class Number(s): CH2023240500908, CH2023240500903, CH2023240500904, CH2023240500906, CH2023240500909, CH2023240500902 | |
| Course code: | BMAT202L | Course Title: | Probability and Statistics | |
| Emp. No.: | 52199,52347, 52850, 52871, 53041, 53149 | Faculty Name: | Dr. Krishna Kumar, Dr. Mythili G Y, Dr. Mohit Kumar, Dr. Avinash Kumar Mittal, Prof. S Sumathi, Dr. Pulak Konar | School: SAS |
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**Answer all the questions** [5 × 10 = 50]

1. Suppose we have marks of 5 students in three subjects History, Biology and Sociology. Use rank correlation method to find out which of the two subjects have the same trend.

| *Marks in History* | 25 | 45 | 35 | 45 | 39 |
|---|---|---|---|---|---|
| *Marks in Biology* | 35 | 41 | 62 | 36 | 47 |
| *Marks in Sociology* | 42 | 33 | 42 | 54 | 42 |

[10]

2. The cumulative distribution function, $F(x)$, of a gamma random variable $X$ is given as $F(x) = \begin{cases} 1 - e^{-x}\left[1 + x + \frac{x^2}{2}\right], & x > 0 \\ 0 \quad , & x \leq 0. \end{cases}$
   i. Obtain the probability density function of $X$.
   ii. Compute $P(2 < X \leq 4)$ and $P(X \geq 2)$.
   iii. Calculate $E(X^2 + X + 1)$ and $Var(-2X)$. [10]

3. a) If the probability of recovery from a certain disease is 0.20 and 10 people came down with the disease,
   i. what is the probability that, at most, 3 of them will recover?
   ii. find the mean and standard deviation of people who can recover from the disease.

   b) The truncated Poisson distribution with the zero class missing has probability mass function
   $P(X = x) = \frac{3^x}{(e^3 - 1)\,x!}, \quad x = 1,2,3, \ldots$ .

Compute

i. $P(2X + 1 \geq 7)$.

ii. Moment generating function, $M_X(t)$, of random variable $X$.

iii. $E(X), E(3X + 1)$ *and* $Var(X)$.

[5 + 5]

4. a) An insurance agent has claimed that the average age of policyholders who insure through him is less than the average for all agents, which is 30·5 years. A random sample of 100 policyholders, who had insured through him gave the following age distribution :

| **Age last birthday** | **No. of persons** |
|---|---|
| 16-20 | 12 |
| 21-25 | 22 |
| 26-30 | 20 |
| 31-35 | 30 |
| 36-40 | 16 |

Calculate the arithmetic mean and standard deviation of this distribution and use these values to test his claim at the 5% level of significance.

b) The average hourly wage of a sample of 150 workers in a plant 'A' was Rs. 2·56 with a standard deviation of Rs. 1·08. The average wage of a sample of 200 workers in plant 'B' was Rs. 2·87 with a standard deviation of Rs. 1·28. Can an applicant safely assume that the hourly wages paid by plant 'B' are higher than those paid by plant 'A'? (Test at the 5% level of significance)

[5 + 5]

5. Find the multiple regression equation for y on $x_1$ and $x_2$ for the data given below

| | | | | | |
|---|---|---|---|---|---|
| $x_1$ | -3 | -1 | -1 | 1 | 2 |
| $x_2$ | -3 | 2 | -1 | -2 | 3 |
| $y$ | -4 | -6 | -1 | 9 | 5 |

[10]