Reg. No.: 21BPS1364

Name : Mubin Chinchwadkar

# VIT

## Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

CHENNAI

### Continuous Assessment Test (CAT)- II– June 2023

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|---|---|---|---|---|---|
| Programme | : | B.Tech. | Semester | : | Fall Inter Semester Year III 2022-2023 |
| Course Title | : | Probability and Statistics | Course Code<br>Slot | :<br>: | BMAT202L<br>A2+TA2 |
| Faculty | : | Dr.Sethukumarasamy K, Dr.Durga Nagarajan, Dr. Ashis Bera, Dr. Pulak Konar, Dr. Biswajit Mallick, Dr. Surath Ghosh, Dr. Mohit Kumar, Dr. Tharasi Dilleswar Rao, Dr. Manigandla Prasannalakshmi, Dr. P Durgaprasad, Dr. Parthiban V, Dr. Jaganathan B, Dr. Dhivya P, Dr. Dr.Uma Maheswari S | Class No. | : | CH2022232500568, 569,570, 586, 571, 572, 573, 574, 575, 576, 577, 460, 578, 461 |
| Duration | : | 1 ½ Hours | Max. Marks | : | 50 |

**Answer all the Questions (50 marks)**

| Q.No. | Question Description | Marks |
|---|---|---|
| 1. | In the study of regression between $X$ and $Y$, the regression equation of $Y$ on $X$ is given by $Y = 6.6 + 0.8X$, the mean $\bar{Y} = 17$, the correlation coefficient $r = 0.60$, and $\mathrm{COV}(X, Y) = 3.2$<br>(a) Obtain the regression equation of $X$ on $Y$<br>(b) Estimate the value of $X$, when $Y = 3$.<br>(c) Find $\mathrm{Var}(3Y)$. | [10] |
| 2. | (a) Let $X$ be an exponential random variable with $E(X) = 1$. Let $Y = \lfloor X \rfloor$, where $\lfloor X \rfloor$ denotes the largest integer not exceeding $X$. Find $P(Y < 1.2)$.<br><br>(b) The service life, in hours, of a semiconductor is a random variable having a Weibull distribution with the parameters $\alpha = 0.025$ and $\beta = 0.5$. How long can such a semiconductor be expected to last? What is the probability that such a semiconductor will still be in operating condition after 4000 hours? | [5+5] |
| 3. | (a) It is known that the bicycles produced by a certain company are defective with a probability of 0.03 and are independent of each other. The company markets diskettes in packages of 20 and offers a money-back guarantee that at most one of the ten bicycles is defective. What proportions of bicycles are returned? If someone buys three bicycles, what is the probability that he will return exactly one of them?<br><br>(b) The life of a component is normally distributed, with mean 250 hours and standard deviation s hours. Find the maximum value of s, so that the probability of the component to have a life between 200 and 300 hours is 0.70. Also find the probability of the component to have a life at least 350 hours for the maximum standard deviation. | [5+5] |

4. Two faculties, X and Y, offered the course Statistics for Engineers in VIT during the Fall Semester of 2017-18. The class strength of Prof.X is 65, and Prof.Y is 35. The class average of CAT 1 handled by Prof.X is 28.86 with standard deviation 5.83, whereas the average of the same course handled by Prof.Y is 30.25 with standard deviation of 6.25. The class average of CAT 2 of same course handled by Prof.X is 23.67 with standard deviation of 6.02 and the average by Prof. Y is 20.23 with stand deviation of 4.82. The class average of FAT in Prof.X's class is 69.2 with a standard deviation of 8.2, and in Prof.Y's class it is 73.5 with a standard deviation of 9.27. Test if there is any **[10]**

(a) Significant difference between CAT 1 and CAT 2 for faculty X.

(b) Significant difference between CAT 2 and FAT for faculty Y

(c) Significant difference between the faculties during FAT.

5. (a) A national survey of restaurant employees found that 75% said that work stress had a negative impact on their personal lives. A sample of 100 employees of a restaurant chain finds that 68 answer 'Yes" when asked, "Does work stress have a negative impact on your personal life?" Is this good reason to think that the proportion of all employees of this chain who would say "Yes" differs from the national proportion? Explain. ($\alpha = 0.05$) **[5+5]**

(b) A civil service examination was given to 200 people. On the basis of their total scores, they were divided into the upper 30% and the remaining 70%. On a certain question, 40 of the upper group and 80 of the lower group answered correctly. On the basis of this question, is this question likely to be useful for discriminating the ability of the type being tested? ($\alpha = 0.05$)

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