

SECTION A
(10 Marks)

Instructions for Section A:

- **Attempt any TWO questions.**
 - **Each question carries 5 marks.**
1. Write a note on continuous random variables. Give the p.d.f. of any two continuous random variables.
 2. Derive the p.m.f., expectation and variance of the Poisson Random Variable.
 3. Write a note, with a rough graphical illustration, on Type I and Type II errors.
 4. Explain why hypothesis testing is done using sampling distribution instead of the population distribution itself. Also, with the help of the population parameters, write what the parameters of the sampling distribution will be.
 5. Explain how Z, Chi Square, F and t distributions are related to each other.
 6. Write the p.d.f of any one of the following continuous random variables and its use in statistical testing: Chi Square, t, F.

SECTION B
(10 Marks)

Instructions for Section B:

- **Attempt any FIVE questions.**
 - **Each question carries 2 marks.**
1. Through an anonymous study it was found that the probability that a student has cheated and performed well in an exam is 23% for an online exam during the pandemic which is a remarkable rise from the probability that the student had cheated and performed well in an exam before the pandemic was 9%. If 85% of students who cheated in exams before the pandemic also cheated in exams during the pandemic, what is the probability that a student who was caught cheating online would have also had a past history of cheating before the pandemic?
 2. Given a population of random variable values, where $X \sim N(10, 8)$, find the following for the sampling distribution created using samples of size 16:
 - a. Distribution parameters- mean, standard deviation, and variance
 - b. Range of scores which lies in an interval of 95% around the mean.
 3. The probability that a delivery agent will deliver an online shopping shipment without any glitch is 0.7. Find the probability that during the entire year, the delivery agent will fumble a delivery 5 times.
 4. In a school, the average percentage of end-of-year exam results is 70.56 (SD= 4.73%). If a class of 40 students who were taught using smart board technology got an average of 79%, find the probability that this percentage was obtained by fluke. Also, what is the

power of a claim made by the principal that use of smart board technology can help increase the school's average performance to 80% (SD= 3%)?

5. The probability that an individual will make it to their class on time on a weekday is 0.4. What is the probability that they will make it to the class on time at least 3 times that week.
6. A Covid-19 drug test showed that there was a difference of 0.5 for the average number of symptoms that a repeated measures sample ($N=51$). If the samples had equal variance of 25 and had a correlation of 0.6, make a decision on whether the drug works.
7. Give the p.d.f. of the continuous random variable which would be used for hypothesis testing for the following scenario:
 - a. Seeking difference of frequency distribution among two categorical variables with 4 and 5 categories.
 - b. Finding if a particular type of intervention works in a study with a control sample of 30 and an experimental sample of 35.
8. Create a sample of 5 elements and explain axioms of probability using those elements.