



23127408

QP CODE: 23127408

Reg No : .....

Name : .....

**B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE  
EXAMINATIONS, OCTOBER 2023  
Third Semester  
COMPLEMENTARY COURSE - ST3CMT03 - STATISTICS - PROBABILITY  
DISTRIBUTIONS**

Common to B.Sc Physics Model I, B.Sc Mathematics Model I & B.Sc Computer Applications Model  
III Triple Main  
2017 Admission Onwards  
3C517D29

Time: 3 Hours

Max. Marks : 80

**Part A**

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. If first three raw moments are  $a$ ,  $b$  and  $c$  respectively, obtain second and third central moments.
2. Show that mgf of the sum of two independent random variables is the product of the mgfs.
3. Define discrete uniform distribution.
4. Define a standardized Poisson random variable.
5. Obtain the mean of hyper geometric distribution.
6. Obtain the first two raw moments of exponential distribution.
7. Obtain the mgf of one parameter gamma distribution.
8. Find the harmonic mean of type - 1 beta distribution.
9. Define type - 2 beta distribution.
10. Mention the importance of central limit theorem.
11. Define chi- square distribution.
12. Define Snedecor's F distribution.

(10×2=20)





### Part B

Answer any **six** questions.

Each question carries **5** marks.

13. Show by an example that expectation of the product is equal to the product of the expectations does not imply that the variables are independent.
14. Find the mean and variance of a random variable  $X$  with pdf  $f(x) = 6x(1-x)$ ;  $0 < x < 1$ .
15. For uniform distribution over  $(0, b)$ , find mgf and hence obtain first four raw moments.
16. Define Bernoulli distribution. Obtain its mean and variance.
17. Find the mode of binomial distribution.
18. Establish the additive property of two parameter gamma distribution.
19. If  $E(X) = 3$ ,  $E(X^2) = 13$ , use Tchebycheff's inequality to find a lower bound for  $P(-2 < X < 8)$ .
20. Suppose  $\bar{x}$  and  $\bar{y}$  be the means of two samples of sizes  $n$  each from a normal population with mean  $\mu$  and SD  $\sigma$ . Determine  $n$  so that the probability will be about 0.95 that the two sample means will differ by less than  $\sigma$ .
21. Explain an example of a statistic following student's  $t$  distribution.

(6×5=30)

### Part C

Answer any **two** questions.

Each question carries **15** marks.

22. The joint pdf of  $X$  and  $Y$  is given by  $f(x, y) = \frac{x+y}{21}$ ;  $x = 1, 2, 3$ ;  $y = 1, 2$ . Find (1)  $V(X)$  (2)  $V(Y)$  (3)  $\text{COV}(X, Y)$ .
23. (a) Obtain the mean and variance of geometric distribution.  
(b) Establish the lack of memory property of geometric distribution.
24. (1) Derive the mgf of normal distribution.  
(2) Derive the mean, median and mode of normal distribution.
25. (1) State and prove Weak law of large numbers.  
(2) State and prove Bernoulli's law of large numbers.

(2×15=30)

