

QP CODE: 22100627



Reg No : .....

Name : .....

**B.Sc DEGREE ( CBCS ) REGULAR / REAPPEARANCE EXAMINATIONS,  
APRIL 2022**

**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  
D2150CE7

Time: 3 Hours

Max. Marks : 80

*core*

**Part A**

*Answer any **ten** questions.*

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

1. Define expectation of a function of a random variable.
2. Write the expressions for second and fourth central moments using raw moments.
3. Buses start from a certain station at intervals of 45 minutes. What is the probability that a person reaching the station randomly will have to wait for at least 30 minutes.
4. Define Bernoulli distribution.
5. If  $n = 200$  and  $p = 0.02$ , find the mode of Poisson distribution.
6. Obtain the mgf of geometric distribution.
7. Define one parameter gamma distribution.
8. Define type - 1 beta distribution.
9. If  $X$  is a normal variable with mean 20 and SD 5, find  $P(16 < X < 22)$ .
10. Mention the importance of central limit theorem.
11. Define student's  $t$  distribution.
12. Define Snedecor's  $F$  distribution.

(10×2=20)





### Part B

Answer any **six** questions.

Each question carries **5** marks.

13. A random variable  $X$  has the pdf given by  $f(x) = 6x(1-x)$ ;  $0 < x < 1$  and 0 elsewhere. Find harmonic mean and mean deviation about mean.
14. Given the pdf  $f(x) = 1/\theta$ ;  $0 < x < \theta$ , find mgf and hence find the variance.
15. From a box containing lots numbered from 1 to 10, one is randomly chosen. Let  $X$  denotes the number drawn. Write the pdf of  $X$ . Find its mean and standard deviation.
16. Find the mean and variance of hyper geometric distribution.
17. If  $X_1, X_2, \dots, X_n$  are  $n$  independent exponential random variables, each with parameter  $\lambda$ , find the distribution of  $Y = X_1 + X_2 + \dots + X_n$ .
18. Find the mean and variance of two parameter gamma distribution.
19. If  $X_i$  is a random variable taking values  $i$  and  $-i$  with equal probabilities, show that weak law of large numbers cannot be applied to the independent sequence  $X_1, X_2, \dots, X_n$ .
20. A population follows normal distribution with mean 2 and SD 3. Find the probability that the mean of a sample of size 16 taken from this population will be greater than 2.5.
21. Derive the mgf of chi - square distribution and hence find mean and variance.

(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)  $COV(X, Y)$ .
23. Fit a binomial distribution to the following data and find the expected frequencies.
 

variable	0	1	2	3	4
frequency	46	28	18	6	2
24. (a) Obtain the mean, variance and harmonic mean of type – 2 beta distribution.  
(b) Show that type – 1 beta distribution can be obtained from type – 2 beta distribution using transformation of variables.
25. (1) State and prove Tchebycheff's inequality.  
(2) What are the advantages and disadvantages of Tchebycheff's inequality.

(2×15=30)

