QP CODE: 22100627

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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/θ ; 0 < x < θ, 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 , ..., X_n are n independent exponential random variables, each with parameter λ , find the distribution of $Y = X_1 + X_2 + ... + X_n$.

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 , ..., 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)