QP CODE: 21102032

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Reg No : ....

Name : ....

B.Sc DEGREE (CBCS)EXAMINATION, AUGUST 2021

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

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Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Define expectation of a function of more than one variable.
2. Find the mgf of $f(x) = a\,e^{-ax}$; $x > 0$, $a > 0$.
3. If X follows binomial distribution with parameters n = 8 and p = 0.4, find the mgf of $y = 3x + 2$.
4. It is known that 5% of the books bound at a certain bindery have defective bindings. Find the probability that 2 of 100 books bound by this bindery will have defective bindings.
5. Define hyper geometric distribution.
6. If X follows exponential distribution with parameter λ , find the pdf of $Y = 3 + 2X$.
7. Find the first two raw moments of one parameter gamma distribution.
8. Obtain the mgf of two parameter gamma distribution.
9. Define type - 1 beta distribution.
10. State Bernoulli's law of large numbers.
11. Define statistic and sampling distribution.
12. Define chi- square distribution.

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Find the first four raw moments and central moments for the following

x	0	1
f(x)	1- p	p

14. Find the mean and variance of a random variable X with pdf $f(x) = 6x(1-x)$; $0 < x < 1$.

15. If X follows discrete uniform distribution and takes values 1, 2, 3, 4, obtain its mgf and hence find mean and variance.

16. A horizontal line of length 5 units is divided by a point chosen at random into two parts. Let the length of the first part be X. Find $E[X(5 - X)]$. Also find the mgf of X and get the mean and variance of X from it.

17. Define Bernoulli distribution. Obtain its mean and variance.

18. Find the mean and variance of normal distribution.

19. A sample of size n is taken from a population with mean μ and SD σ . Find the limits within which the sample mean $\overline{x}$ will lie with probability 0.9 by using Tchebycheff's inequality and central limit theorem. Evaluate the limits if $n = 64$, $\mu = 10$ and $\sigma = 2$.

20. Explain an example of a statistic following student's t distribution.

21. If X is a random variable following F distribution with (n_1, n_2) degrees of freedom, show that $Y = 1/X$ follows F distribution with (n_2, n_1) degrees of freedom.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. Let X and Y have the joint pdf $f(x, y) = (x + 2y)/18$; $x = 1, 2$, $y = 1, 2$. Find the correlation between X and Y.

23. (a) Obtain the mean and variance of geometric distribution.
(b) Establish the lack of memory property of geometric distribution.

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) Two unbiased dice are thrown and X denotes the sum of the numbers shown. Find an upper bound to the probability that X will not be between 4 and 10 using Tchebycheff's inequality.

(2×15=30)