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S – 3427

Reg. No. : ....

Name : ....

Third Semester B.Sc. Degree Examination, February 2024

First Degree Programme under CBCSS

Statistics

Complementary Course for Physics

ST 1331.2 : PROBABILITY DISTRIBUTIONS AND STOCHASTIC PROCESSES

(2022 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** question carries **1** mark.

1. Define binomial distribution.

2. Comment on the statement: "For a Poisson distribution Mean=2 and variance=4".

3. Obtain the mean of geometric distribution.

4. State the conditions under which the Normal distribution as a limiting form of binomial distribution.

5. State the additive property of Gamma distribution.

6. Define standard error.

7. Define ordered sample.

P.T.O.

8. Give the probability density function of Chi-square distribution with n degrees of freedom.

9. Define transition probability matrix.

10. Define stochastic process.

($10 \times 1 = 10$ Marks)

SECTION – B

Answer any **eight** questions. **Each** question carries **2** marks.

11. Ten unbiased coins are tossed simultaneously. Find the probability of obtaining not more than three heads.

12. If a random variable X follows Poisson distribution such that $P(X=1)=P(X=2)$, find the mean and variance.

13. Let $X \sim U[a, b]$, find the mean and variance.

14. Define beta distribution of first kind. Find its mean.

15. If X is a normal variate with mean 30 and standard deviation 5. Find $P(|X - 30| > 5)$.

16. Obtain the sampling distribution of the mean of the samples from a normal distribution.

17. What is the relation between t and F.

18. Define Student's t distribution. Give any two applications.

19. Define F-distribution. Give one application.

20. Define Fermi-Dirac statistic.

21. Define wide sense stationary stochastic process.

22. Define Brownian motion process.

($8 \times 2 = 16$ Marks)

SECTION – C

Answer any **six** questions. **Each** question carries **4** marks.

23. State and prove the additive property of independent Poisson variates.

24. State and prove the lack of memory property for the exponential distribution.

25. In a distribution exactly normal, 10.03% of the items are under 25-kilogram weight and 89.97% of the items are under 70-kilogram weight. What are the mean and standard deviation of the distribution?

26. Let $X_i (i = 1,2,...,n)$ be *i.i.d* random variables. Then show that min $(X_1, X_2,..., X_n)$ has a Weibull distribution if and only if the common distribution of X_i's is Weibull distribution.

27. Obtain the relation between F and χ^2 distribution.

28. If X and Y are independent rectangular variates on [0,1], find the distribution of X/Y.

29. Distinguish between Bose-Einstein and Maxwell-Boltzman statistic.

30. Define Poisson process and explain its postulates.

31. Explain the different classifications of stochastic process with examples.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

32. (a) Determine the binomial distribution for which the mean is 4 and variance 3 and find its mode.

(b) Fit a Poisson distribution to the following data:

x	0	1	2	3	4
f	109	65	22	3	1

33. If X and Y are independent normal variates possessing a common mean μ. such that $P(2X+4Y \leq 10)+P(3X+Y \leq 9)=1$ and $P(2X-4Y \leq 6)+P(Y-3X \geq 1)=1$, determine the values of μ.

34. Define Chi-square distribution. If X and Y are two independent χ^2 variates with n_1 and n_2 degrees of freedom respectively, then find the distribution of $\frac{X/n_1}{Y/n_2}$.

35. (a) Explain Markov Process.

(b) Define random walk and write down the transition probability matrix of classical random walk.

(2 × 15 = 30 Marks)
