

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, March 2022

First Degree Programme under CBCSS

Statistics

Complementary Course for Physics

ST 1331.2 : PROBABILITY DISTRIBUTIONS AND STOCHASTIC PROCESS

(2017 & 2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

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

1. Define a geometric distribution.
2. Give the pdf of a Poisson distribution.
3. Write the mean and variance of a Negative Binomial distribution.
4. What is the distribution of the sample mean when a random sample of size 25 is taken from a Normal population with mean 10 and variance 100?
5. Which continuous distribution has the lack of memory property?
6. State the Central Limit Theorem.
7. Define sampling distribution.

8. What is the relation between the Chi-square random variable and the students t random variable?
9. What do you mean by ordered samples?
10. Define a Brownian motion.

(10 × 1 = 10 Marks)

SECTION – B

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

11. Establish the moment generating function of a discrete uniform distribution.
12. What are the assumptions of a Binomial distribution?
13. Give some applications of the Poisson distribution.
14. Why the Normal distribution is also known as the Gaussian law of errors?
15. What is entropy of an exponential distribution?
16. If the shape parameter of a Gamma distribution is one, what is the resultant distribution?
17. Define multiplets.
18. State the additive property of the chi-square distribution.
19. Define the F statistic. Give an example.
20. Define a Fermi-Dirac function.
21. What do you mean by the time space and state space of a stochastic process?
22. Define a Markov process.

(8 × 2 = 16 Marks)

SECTION – C

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

23. If X is a Poisson Random variable such that $P(X=1)=P(X=2)$, then find $P(X=4)$.
24. Establish the moment generating function of a Negative Binomial distribution.
25. State and prove the reproductive property of the Binomial distribution.
26. Find the mean deviation about mean of a continuous rectangular (Uniform) distribution in the interval (a, b) .
27. Find the r^{th} raw moment of a Beta type I distribution. Hence find its mean and variance.
28. If $\eta_1 = \eta_2$, in an F distribution, then find its median.
29. How is the Maxwell-Boltzmann distribution different from the Bose-Einstein distribution?
30. Define transition probability matrix of a Markov chain and state its properties.
31. Define a Poisson process. State the postulates of a Poisson process.

(6 × 4 = 24 Marks)

SECTION – D

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

32. If X is a Poisson variate with parameter λ and μ_r is the r^{th} central moment, then prove that $\lambda \left\{ \binom{r}{1} \mu_{r-1} + \binom{r}{2} \mu_{r-2} + \dots + \binom{r}{r} \mu_0 \right\} = \mu_{r+1}$.
33. Establish the relationship between Q.D, M.D and S.D for a Normal distribution.

34. (a) Find the sampling distribution of sample mean of a random sample of size n taken from a Normal population.
- (b) Ten individuals are chosen at random and their heights are found to be in inches as 63,66,71,63,68,70,69,67,71,70. If the mean height of the population is 66 inches, find the probability of getting a sample for which the mean may differ from 66 by more than the mean of this sample.
35. Discuss the various classifications of Stochastic Processes with appropriate examples.

(2 × 15 = 30 Marks)

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