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Electronics and Communication Engineering Department NIT Hamirpur (HR) End Semester Examination - May 2023

Semester: 8th

Sub: Modeling and Simulation of Communication System Max. Marks = 50 B.Tech ECE DD Code: EC-622 Time = 3:00 Hrs

- Note:
 - 1. All questions are compulsory
 - 2. Assume suitable data whenever necessary
- Q.No.1. Discuss complex gaussian random vector. Find out autocovariance and pseudo autocovariance matrix with reference to complex gaussian random vector. What is circular random variable?
- Q.No.2. In the context of wireless communication, explain the statistical properties of the complex fading coefficient h. Derive the probability density function for both the amplitude and phase factor of the fading coefficient h.
- Q.No.3. In the context of random parameters, explain the Bayes estimate for the following error functions:
 - (A) mean-squared error,
 - (B) absolute error, and
 - (C) uniform cost function error.

Take any *example* for each of the case and find out the estimate.

- **Q.No.4.** How do Queuing Models work? Provide a comprehensive discussion on the characteristics of Queuing Systems, Queuing Notation, and Long Run Performance Measures of Queuing Systems.[8]
- Q.No.5. What is Poisson random variable? Explain the acceptance-rejection technique in the context of generating random variates for Poisson and nonstationary Poisson distributions. Discuss the implementation of this technique by taking any suitable example. [6]
- Q.No.6. Explain the concept of additive white Gaussian noise (AWGN) in wireless communication systems. Calculate the bit error rate (BER) for a binary phase shift keying (BPSK) modulated signal in the presence of AWGN. Compare the performance of the wireless communication system to a wired communication system, both using BPSK modulation and AWGN.

[6]

Q.No.7. Discuss random variate generation for the following Empirical Discrete Distribution:

1. Discrete Uniform Distribution

2. Geometric distribution case

by taking any suitable example.

Q.No.8. Discuss the Measure of Quality of Estimation for the case of non-random parameter? [5]

[6]

Q.No.9. In the context of queuing theory, provide detailed explanations of the following concepts: [4]

• Steady state behavior of M/M/1 and M/M/1/N queuing models

- Burke's theorem
- Polling and random-access systems.