

SIGNAL AND SYSTEM QUESTION PAPER ANSWER

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Signal and Systems Question Paper Answer

Question 1: Determine the Laplace transform of the signal $x(t) = e^{-at}u(t)$, where $u(t)$ is the unit step function.

Answer: $X(s) = 1 / (s + a)$

Question 2: Find the Fourier transform of the signal $x(t) = \sin(2\pi f_0 t)$.

Answer: $X(\omega) = \pi[\delta(\omega - 2\pi f_0) + \delta(\omega + 2\pi f_0)]$

Question 3: A discrete-time signal $x[n]$ is described by the difference equation $x[n] - 2x[n-1] + 3x[n-2] = 5$. Determine the impulse response $h[n]$ of the system.

Answer: $h[n] = (1/6) * (3^n u[n] - 2^{n+1} u[n-1])$

Question 4: Consider a continuous-time LTI system with transfer function $H(s) = s + 1 / (s^2 + 4s + 3)$. Determine the frequency response $H(\omega)$.

Answer: $H(\omega) = (1 + j\omega) / ((3 - \omega^2) + 4j\omega)$

Question 5: A random variable X has a probability density function given by $f(x) = Ae^{-|x|}$, where A is a constant. Determine the value of A that makes $f(x)$ a valid probability density function.

Answer: $A = (1/2)$

The Odyssey Study Guide Answers

1. Who is the main character of the Odyssey and what is his goal?

Answer: Odysseus, the king of Ithaca, is the main character of the Odyssey. His goal is to return home after fighting in the Trojan War for 10 years.

2. What is the name of Odysseus's ship and who are his crew?

Answer: Odysseus's ship is called the Nostos. His crew includes his loyal followers Eurylochus, Eurymedon, and Elpenor.

3. What is the first major obstacle that Odysseus faces on his journey home?

Answer: The first major obstacle Odysseus faces is the land of the Lotus-Eaters, where he and his crew become entranced by the lotus plant and forget their mission. However, Odysseus remembers his goal and forces his crew to leave.

4. What is the Cyclops's name and what does he do to Odysseus and his crew?

Answer: The Cyclops's name is Polyphemus. He captures Odysseus and his crew and eats several of them. Odysseus tricks Polyphemus by getting him drunk and then blinds him with a sharpened stake.

5. What does Circe tell Odysseus he must do to return home?

Answer: Circe tells Odysseus that he must first visit the underworld and speak to the prophet Tiresias. Tiresias reveals that Odysseus will eventually return home but must beware of the Sirens, the Scylla and Charybdis, and the Cattle of the Sun.

Solutions for Sampling Techniques: Cochran 3rd Edition

Q1: Explain the concept of a finite population correction factor (fpc).

A1: The fpc is a correction factor applied to the sample variance to account for the fact that a sample is drawn from a finite population rather than an infinite population. It ensures that the sample variance is an unbiased estimate of the population variance.

Q2: Describe the advantages of stratified random sampling.

A2: Stratified random sampling divides the population into mutually exclusive and exhaustive strata, then randomly selects a sample from each stratum. Advantages include increased precision, reduced sampling error, and the ability to estimate subgroup parameters.

Q3: Explain how systematic sampling differs from simple random sampling.

A3: In systematic sampling, a starting point is randomly selected, and subsequent units are selected at regular intervals. Unlike simple random sampling, systematic sampling does not give all units an equal chance of being selected. However, it can be more efficient and practical in certain situations.

Q4: Discuss the role of sample size in sampling techniques.

A4: Sample size is a critical factor in sampling. It determines the precision of the sample estimates and the confidence level of the inferences made. Larger samples generally lead to more precise estimates and higher confidence levels.

Q5: Describe the steps involved in conducting cluster sampling.

A5: Cluster sampling involves dividing the population into clusters and then randomly selecting a sample of clusters. The units within the selected clusters are then included in the sample. It is often used when the population is geographically dispersed or when units are clustered together.

The Rise of the West: A History of Human Community, by William Hardy McNeill

Question: What is the central thesis of McNeill's book?

Answer: McNeill argues that the rise of the West, from its humble beginnings in the Fertile Crescent to its global dominance in the modern era, was a result of a complex interplay of environmental, technological, and social factors.

Question: What were some of the key environmental factors that influenced Western development?

Answer: McNeill highlights the importance of the Mediterranean climate, temperate forests, abundant water resources, and navigable rivers, which facilitated trade and population growth.

Question: How did technology contribute to Western expansion?

Answer: Innovations such as the wheel, the sail, and the printing press allowed Westerners to overcome geographical barriers, expand their reach, and disseminate knowledge and ideas.

Question: What were the major social factors that shaped Western history?

Answer: McNeill emphasizes the role of institutions, such as law, government, and science, in creating a stable and prosperous society. He also highlights the importance of the Christian tradition, which provided a moral framework and a sense of unity.

Question: What are the implications of McNeill's theory for our understanding of human history?

Answer: McNeill's work challenges the notion of Western superiority, arguing that the rise of the West was not inevitable but rather a result of specific historical contingencies. He also suggests that the interconnectedness of human communities has shaped the course of human civilization.

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