

Midterm Exam

CS232/NetSys201/EECS248 - Fall 2025

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- Partial and unsatisfactory answer/solution will receive a fraction of the points, whereas excellent answers may exceed the indicated points.
- Use of books/notes is forbidden.
- Put your answer into the box below for Q1-Q10

Q1	Q2	Q3	Q4	Q5
d	c	a	a	a
Q6	Q7	Q8	Q9	Q10
b	a	a	a	b

Q1 (6pt) Consider an exponentially distributed r.v. X . We know that $X > s$. Define Y as the residual $t - s$, with $t > s$. We then have:

- $P(X > s) = P(X > t)$
- $P(Y > t) = P(X > t)$
- $P(X > t) = 1$
- $P(Y > t | X > s) = P(X > t)$

Q2 (6pt) Consider a set of random variables X_1, X_2, \dots, X_N . The variables are independent and distributed according to exponential distributions with parameters $\lambda_1, \lambda_2, \dots, \lambda_N$. The probability that the smallest value is associated with variable i is

- λ_i
- $\lambda_1 + \dots + \lambda_N$
- $\lambda_i / (\lambda_1 + \dots + \lambda_N)$
- $(\lambda_1 + \dots + \lambda_N) / \lambda_i$

Q3 (6pt) In the same setting as the previous question. Define $X = \min(X_1, X_2, \dots, X_N)$ and $\lambda = \lambda_1 + \lambda_2 + \dots + \lambda_N$. We then have

- $P(X > t) = e^{-\lambda t}$

- b) $P(X > t) = e^{\lambda t}$
- c) $P(X > t) = e^{-t}$
- d) $P(X > t) = e^{t/\lambda}$

Q4 (6pt) HTTP has a

- a) Client-Server architecture
- b) Peer-to-Peer architecture
- c) a Hybrid architecture

Q5 (6pt) Email applications have a

- a) Client-Server architecture
- b) Peer-to-Peer architecture
- c) a Hybrid architecture

Q6 (6pt) In the internet, resource sharing is

- a) Deterministic
- b) Statistical

Q7 (6pt) In the telephone network, resource sharing is

- a) Deterministic
- b) Statistical

Q8 (6pt) Compared to that of trunks, the capacity of telephone network's local loops typically is

- a) Smaller
- b) Larger

Q9 A Poisson process generates events at rate λ . Each event is **discarded** with probability p . At time T , what is the expected time to the next (non discarded) event?

- a) $1/((1-p)\lambda)$
- b) $1/(p\lambda)$
- c) $(1-p)\lambda$
- d) λ/p

Q10 (6pt) In HTTP, packet loss is

- a) Ok
- b) Not Ok

Q11 (10pt) List and discuss the characteristics of the “voice” application that led to the design of the telephone network.

Q12 (10pt) Describe the terms: “Synchronous”, “Connection-Oriented” and “Reliable” in the context of communication networks. Are the telephone network and internet synchronous or asynchronous? Connection oriented or non-connection oriented? Reliable or non-reliable?

Q13 (10pt) Fully connected, star and hybrid topology. Which one is the best choice in large scale networks? Explain your answer.

Q14 Describe the characteristics of resource sharing in the internet routers.