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CS 348: Computer Networks
Spring 2022-23, IIT Dharwad

Mid-semester Exam
February 21, 2023
10 AM to 12 Noon

Total Marks: 39

Section 1 [12 marks]

- One or more option(s) may be correct for all MCQs in this section.
- Negative marking of -1 applies for all questions in this section.
- No partial marking.

✓ Q1. [-1/+1 mark] One's complement sum of 101010 and 100100 is 110100.

✗ Q2. [-1/+1 mark] TCP uses _____ ACK

- a. Selective
- b. Cumulative ✓
- c. Both of the above
- d. None of the above

✗ Q3. [-1/+1 mark] Which of the following features are NOT part of the reliable data transfer service offered by TCP?

- a. Guaranteed delivery ✓
- b. In-order delivery ✓
- c. Error-free delivery ✓
- d. Time-bound delivery ✓
- e. Minimum throughput guarantee ✓

✓ Q4. [-1/+1 mark] On the server-side, a TCP socket is identified by a _____-tuple, whereas a UDP socket is identified by a _____-tuple.

- a. 2, 2
- b. 2, 4
- c. 4, 2 ✓
- d. 4, 4

✓ Q5. [-1/+1 mark] Match the following. State your answer as 1-a, 2-b, ...

1. Application Layer
2. Internet Layer
3. Link Layer
4. Physical Layer
5. Transport Layer

- a. Bit ✓
- b. Byte
- c. Chunk
- d. Datagram ✓
- e. Frame ✓
- f. Message ✓
- g. Segment ✓

Q6. [-1/+1 mark] Which one or more of the following protocols has/have different format for its request and response messages?

- a. HTTP
- b. DNS
- c. TCP
- d. UDP

Q7. [-1/+1 mark] Which of the following is NOT true for the Dynamic Adaptive Streaming over HTTP (DASH) protocol?

- a. Server periodically estimates server-to-client bandwidth
- b. Each client maintains a manifest file
- c. The complete video can only be streamed at a fixed rate
- d. All of the above

Q8. [-1/+1 mark] Every 30 secs, a BitTorrent sender _____ one peer.

- a. optimistically chokes
- b. optimistically unchokes
- c. pessimistically chokes
- d. pessimistically unchokes

Q9. [-1/+1 mark] A network socket connects:

- a. Processes
- b. Hosts
- c. Applications
- d. Ports

Q10. [-1/+1 mark] HTTP is a _____ protocol.

- a. stateful
- b. stateless
- c. None of the above

Q11. [-1/+1 mark] Caching is NOT applicable for:

- a. HTTP
- b. DNS
- c. SMTP
- d. Video streaming

Q12. [-1/+1 mark] In Content Distribution Networks, compared to the enter deep approach, the bring home approach results in:

- a. Fewer larger servers/clusters
- b. Greater number of larger servers/clusters
- c. Fewer smaller servers/clusters
- d. Greater number of smaller servers/clusters

Section 2 [27 marks]

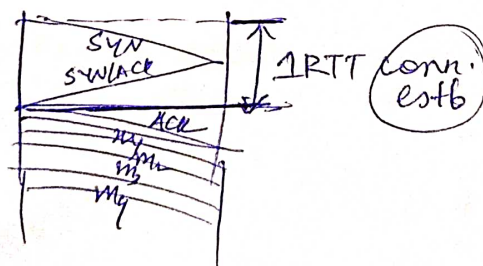
- Q13. [4 marks] State and explain the different types of delays in packet networks.
- Q14. [4 marks] State and explain the various services offered by the Domain Name System.
- Q15. [2 marks] State the drawbacks of the layered approach to the Internet design.
Redundant processing
Header Length
- Q16. [3 marks] What are the different indicators by means of which a sender can detect network congestion?
(-delayed ACK -> missing ACK) (increasing RTT)
(-duplicate ACK)
- Q17. [2 marks] Define and explain the Head of Line blocking problem in the context of a web client fetching multiple objects from a web server.
- Q18. [2 marks] Why is the DNS not implemented in a centralized manner?
Single pt. of failure
heavy load
distant/far from some
- Q19. [4 marks] List and explain any four reliable data transfer mechanisms.
rdt <-> tran.
- Q20. [2 marks] Illustrate the significance of a three-way handshake over a two-way handshake, using a concrete example. *EZ*

Q21. [4 marks] Suppose in a web browser, you click on the `www.cs648.in` URL. The browser cache is empty. The IP address for this URL is not cached in your local host, so a DNS lookup is triggered (by the local DNS server deployed on your local host) over the 3-tier DNS hierarchy in an iterative mode. No resource records are cached anywhere across all DNS servers.

Let RTT denote the round trip time between your local host and DNS servers in the DNS hierarchy. The round trip time between the local host and the web server hosting `www.cs648.in` is also equal to RTT. The HTML file associated with the URL is small enough to have negligible transmission time and negligible rendering time by your web browser, which references 10 equally small objects on the same web server.

Derive the minimum elapsed time between clicking on the URL and your browser fully rendering it, in case of:

- [2 marks] non-persistent HTTP with five parallel TCP connections *5 RTT*
- [2 marks] persistent HTTP with pipelining *3+2+1=6 RTT*



3 RTT: DNS
 1 RTT: base page
 5 RTTs: connst get

