Code : 326106

MCA 1st Semester Exam., 2024

COMPUTER NETWORKS

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

*(ii) There are **SEVEN** questions in this paper.*

*(iii) Attempt **FIVE** questions in all.*

*(iv) Question Nos. **1** and **2** are compulsory.*

SECTION—A

1. Choose the correct answer of the following : 2×10=20

(a) What is the default subnet mask for a class A network?

(i) 127.0.0.1

(ii) 255.0.0.0

(iii) 255.255.255.0.0

(iv) 255.255.255.0

(b) What is the maximum size of data that the application layer can pass on to the TCP layer below?

(i) Any size

(ii) 2^{16} bytes-size of TCP header

(iii) 2^{16} bytes

(iv) 1500 bytes

(c) Which transmission media has the highest transmission speed in a network?

(i) Coaxial cable

(ii) Twisted pair cable

(iii) Optical fiber

(iv) Electrical cable

(d) Which one of the following tasks is not done by data link layer?

(i) Framing

(ii) Error control

(iii) Flow control

(iv) Channel coding

(e) An endpoint of an inter-process communication flow across a computer network is called

(i) socket

(ii) pipe

(iii) port

(iv) None of the mentioned

(f) What is the maximum header size of an IP packet?

(i) 32 bytes

(ii) 64 bytes

(iii) 30 bytes

(iv) 60 bytes

(g) Which of the following statements is true about error detection techniques used on communications link?

(i) Cyclic Redundancy Check (CRC) sequence can detect as well as correct errors

(ii) Error detection cannot be used on simplex links

(iii) Hamming code can detect up to 3-bit errors

(iv) All of the above

(h) Which of the following is/are protocol(s) of application?

(i) FTP

(ii) DNS

(iii) Telnet

(iv) All of the above

(i) The domain name system is maintained by

(i) distributed database system

(ii) a single server

(iii) a single computer

(iv) None of the mentioned

(j) FTP server

(i) maintains state information

(ii) is stateless

(iii) has single TCP connection for a file transfer

(iv) has UDP connection for file transfer

SECTION—B

Answer any *four* out of *five* questions : 5×4=20

2. (a) Describe three common network topologies (e.g., star, ring, mesh) and their key characteristics, including the advantages and disadvantages of each topology in terms of scalability, fault tolerance, and maintenance.

(b) Describe the process of framing in the Data Link Layer and its importance in data communication. Discuss two different framing methods.

(c) Describe the CSMA protocol and how it differs from CSMA/CD in terms of detecting and managing collisions in a network. Provide examples of network environments where each would be most effectively utilized.

(d) Describe the structure of both TCP and UDP headers, highlighting the key fields and their purposes.

(e) Discuss how SMTP is used for sending e-mails, including the process of mail transfer from a client to a server and then between servers.

SECTION—C

Answer any *three* out of *five* questions : 10×3=30

3. Discuss in detail the mechanisms of congestion control in TCP, including the algorithms for avoiding and controlling congestion within a network. Describe the theoretical foundations of congestion control and the role of key elements such as congestion window, slow start, congestion avoidance, and fast recovery.

4. Elaborate on the role of Simple Mail Transfer Protocol (SMTP) in the email delivery system, including its interaction with other email protocols like IMAP and POP3 for email retrieval. Describe the SMTP communication process, including the command/response sequence, status codes, and the use of MIME (Multipurpose Internet Mail Extensions) for sending non-text data.

5. Provide a detailed comparison of the Stop-and-Wait and Go-Back-N Automatic Repeat Request (ARQ) protocols, including their mechanisms for ensuring reliable data transfer over unreliable channels.

6. Explain the principles of Time Division Multiple Access (TDMA) and Frequency Division Multiple Access (FDMA) as they are applied in wireless communication systems. Discuss the technological foundations of each access method, including how they allocate network resources (time and frequency, respectively) to support multiple users' communications. Analyze the advantages and disadvantages of TDMA and FDMA in terms of spectrum efficiency, complexity, and scalability.

7. An IP datagram is carrying a TCP segment destined for address 130.14.16.17/16. The destination port address is corrupted, and it arrives at destination 130.14.16.19/16. How does the receiving TCP react to this error? Show the entries for the header of a TCP segment that carries a message from an FTP client to an FTP server. Fill the checksum field with 0s. Choose an appropriate ephemeral port number and the correct well-known port number. The length of the data is 40 bytes.

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