M. E. Electronics & Telecommunication Engineering Examination 2024
(1st Year, 1st Semester)
Computer Communication Networks (COMM/COMP)

Time: 3 Hours   Full Marks: 100

Answer any five questions
All questions carry equal marks
Answer all the parts of a question in the same place

1. a) Write the basic functionalities of following three layers of OSI model
      i) Data link layer ii) Network layer   iii) Application layer
   b) How are private IP addresses connected to the Internet?
   c) Write the characteristics and applications of UDP
   d) Why pseudo-header is added in a UDP datagram?
   e) Briefly explain the working principle of SCTP.

                                                      (6+4+4+2+4)

2. a) Mention the merits and demerits of Stop-and-Wait ARQ technique.
   b) Compare Go-Back-N ARQ protocol with Stop-and-Wait ARQ protocol
   c) What is piggybacking? What is its advantage?
   d) Define propagation time and transmission time of a network.
   e) An image of size 5 MB has to be transferred through an optical fiber link of bandwidth
      1Mbps. Assume that the distance between the sender and the receiver is 12000 km and
      optical signal travels at 2.4×108 m/s. Calculate propagation time and transmission time.
   f) What is the total delay for a frame of size 5×10^6 bits that is being sent on a link with 10
      routers each having a queuing time of 2 μs and a processing time of 1 μs. The length of
      the link is 2000 km. The speed of light inside the link is 2×10^8 m/s. The link has a
      bandwidth of 5 Mbps.

                                                      (4+4+4+2+3+3)

3. a) If the data link layer can detect errors between hops, why we need another checking
      mechanism at the transport layer?
   b) How TCP establishes and terminates a connection?
   c) Write the different causes of congestion. How congestion control and quality of service
      are related?
   d) Figure 1 shows the part of a computer network, where alphabets represent nodes and
      weights represent distance. Find the shortest path from node A to node D using
      Dijkstra's algorithm.

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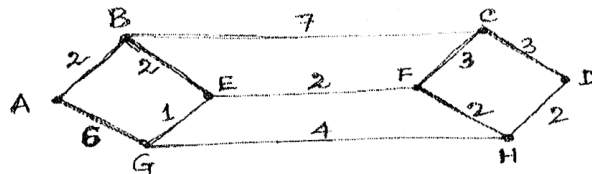
Fig. 1

(2+6+6+6)

4. a) Write the advantages of slotted ALOHA over pure ALOHA protocol and derive an analytical expression for expected number of retransmissions per frame transmission time for slotted ALOHA protocol, considering Poisson distribution for frame generation.

b) With a neat sketch explain the working principle of token passing multiple access technique

c) What do you mean by mask? Write the disadvantages of classful addressing? Why IPv6 addresses are necessary?

d) What do you mean by socket address? Write its application.

(7+6+4+3)

5. a) Why CSMA/CD is not preferable in wireless networks? What is interframe space? Explain the working principle of CSMA/CA using a flow diagram.

b) Write the relative merits and demerits of Byte oriented framing and Bit oriented framing.

c) What is user agent in an electronic mail system? Write the services provided by a user agent.

d) What is DNS? Write its advantage.

((3+6) +4+4+3)

6. a) What do you mean by confidentiality? How it is provided in a computer network?

b) With a neat sketch describe the encryption and decryption techniques of Advanced Encryption Standard (AES).

c) In RSA, given two prime numbers p = 19 and q = 23. Find d for a given e = 5.

d) What is one-time pad? Write the merits, demerits and application of stream cipher RC4.

(4+9+3+4)

7. a) What do you mean by lossy compression? Write the merits and demerits lossless compression method.

b) What do you mean by predictive encoding and perceptual encoding?

c) Draw the basic block diagram of JPEG compression process.

d) A source generates seven different messages m_1, m_2,..., m_7 with probabilities $\frac{1}{3}, \frac{1}{3}, \frac{1}{9}, \frac{1}{9}, \frac{1}{27}, \frac{1}{27}, \frac{1}{27}$ respectively. Find the code for each message and average length of compact code using Huffman coding technique. Also calculate the minimum possible code length and code efficiency.

(5+4+2+9)