AUTUMN MID SEMESTER EXAMINATION-2022

School of Computer Engineering
Kalinga Institute of Industrial Technology, Deemed to be University
Computer Network
[IT-3005]

Time: 1 1/2 Hours   **Full Mark: 20**

Answer any four Questions including Q.No.1 which is Compulsory.
The figures in the margin indicate full marks. Candidates are required to give their answers in their own
words as far as practicable and all parts of a question should be answered at one place only.

1. Answer all the questions.   [1 x 5]

   a) Station B needs to send a message consisting of 9 packets to Station C using a sliding window (window size 3) and go-back-n error control strategy. All packets are ready and immediately available for transmission. If every 5th packet that B transmits gets lost (but no acks from C ever get lost), then what is the number of packets that B will transmit for sending the message to C?

   ANS: 16

   b) What are the minimum functionality should be implemented by a transport protocol over and above the network protocol?

   ANS: End to end connectivity is the required functionality provided by Trnasport protocol. UDP of transport layer protocol that doesn't implement other three functionalities, they are implemented only in TCP

   c) A client uses UDP to send data to a server. The data is 16 bytes long. Calculate the efficiency of transmission at the UDP level.
   ANS: 8 byte header + 16 bytes data = 24 bytes
   16/24 = 66.667% efficiency

   d) What would be the type of resource record (RR) that contains the canonical name of the host?
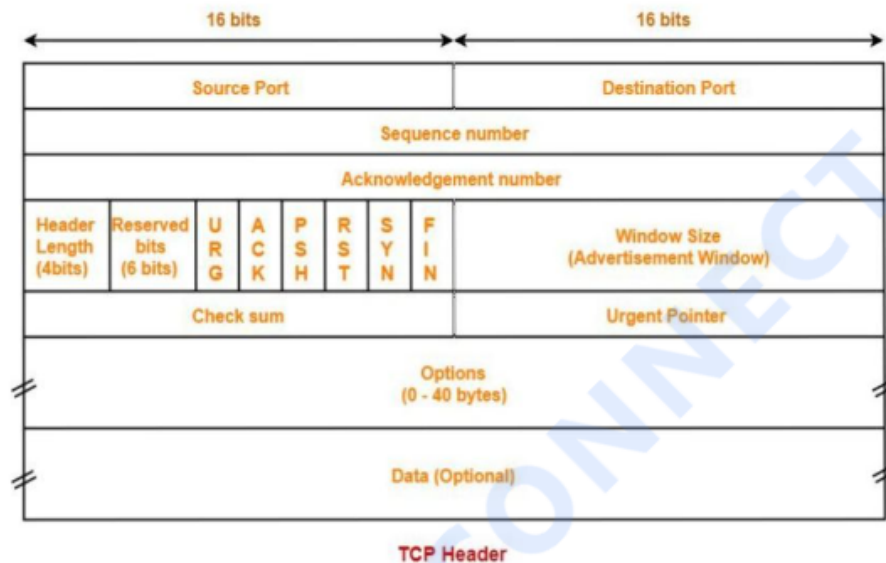   ANS: CNAME

   e) In a client-server architecture, why is it necessary to keep the server always on where as the client can be on or off from time to time.
   ANS: A server is a computer on a network that provides a resource that can be used by any authorized client station. To make the server available all the time to each client, it should be always on.

2.   [2.5+2.5]

(a) Explain the different fields of a TCP header along with a header diagram. If the size of a TCP segment is 1KB and header length value is 6, the sequence number = 3500. Given that URG flag = 1 and URG pointer = 45. Then how many of them are urgent data, Give the sequence numbers of urgent data.

ANS:

TCP Header

Explanation of each fields.

Given

  size of a TCP segment = 1KB

  header length = 6

  sequence number = 3500

  URG flag = 1

  URG pointer = 45

Solution

    sequence number of the first byte = 3500

   Assuming urgent pointer specifies up to what sequence number data is urgent

     URG pointer = 45 [given value]

  then, up to sequence number of 3500+45 = 3545 data is urgent i.e., total of 46 bytes

Answer

  46 bytes of urgent data, sequence number is 3500-3545

(b) Using caching, the response time of downloading a object can be reduced. However, it may introduce a stale cache problem. Describe how HTTP handle this problem.

ANS: Stale data is an artifact of caching, in which an object in the cache is not the most recent version committed to the data source. To avoid stale data, implement an appropriate cache locking strategy.

The following shows how a HTTP client imposes the modification data and time condition on a request.

GET http://www.commonServer.com/information/file1 HTTP/1.1	**Request line**
If-Modified-Since: Thu, Sept 04 00:00:00 GMT	**Header line**
	Blank line

The status line in the response shows the file was not modified after the defined point in time. The body of the response message is also empty.

HTTP/1.1 304 Not Modified	**Status line**
Date: Sat, Sept 06 08 16:22:46 GMT	**First header line**
Server: commonServer.com	**Second header line**
	Blank line
(Empty Body)	**Empty body**

3. [2.5+2.5]

(a) DNS can use either UDP or TCP as a transport layer protocol. Explain, in what circumstance UDP is preferred over TCP and vice-versa.

ANS: There are the following interesting facts about TCP and UDP on the transport layer.
1) UDP is much faster. TCP is slow as it requires a 3-way handshake. The load on DNS servers is also an important factor.
2) DNS requests are generally very small and fit well within UDP segments.
3) UDP is not reliable, but reliability can be added to the application layer. An application can use UDP and can be reliable by using a timeout and resend at the application layer.
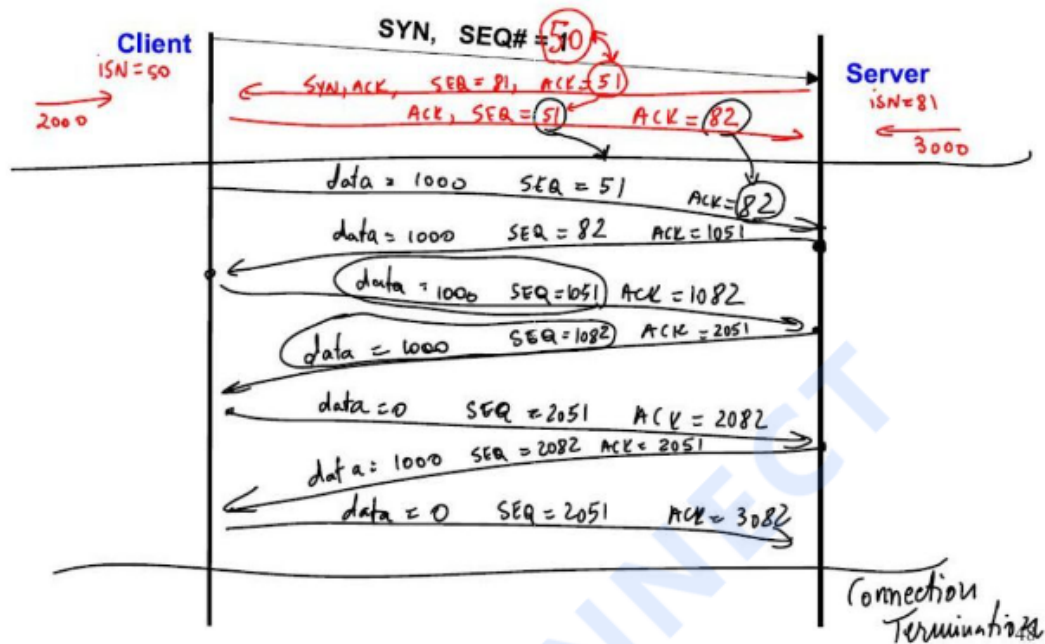
Actually, DNS primarily uses the User Datagram Protocol (UDP) on port number 53 to serve requests. DNS queries consist of a single UDP request from the client followed by a single UDP reply from the server. When the length of the answer exceeds 512 bytes, larger UDP packets are used. Otherwise, the query is sent again using the Transmission Control Protocol (TCP). TCP is also used for tasks such as zone transfers.

(b) Following are the information for a TCP Client and a Server:

– The MSS (Maximum Segment Size) in both directions is 1000 bytes.

– The ISN (Initial Sequence Number) for Client is 50 and for Server is 81.

The Client sends 2000 bytes to the Server and the Server sends 3000 bytes to the client. Give the complete TCP message exchange between client and server. For each segment draw a vector showing the value of the SYN, ACK and FIN bits, with the value of the SEQ (Sequence Number) and the ACK (Acknowledgement Number). Assume no packets are lost and the application consumes the data as soon as it is received.
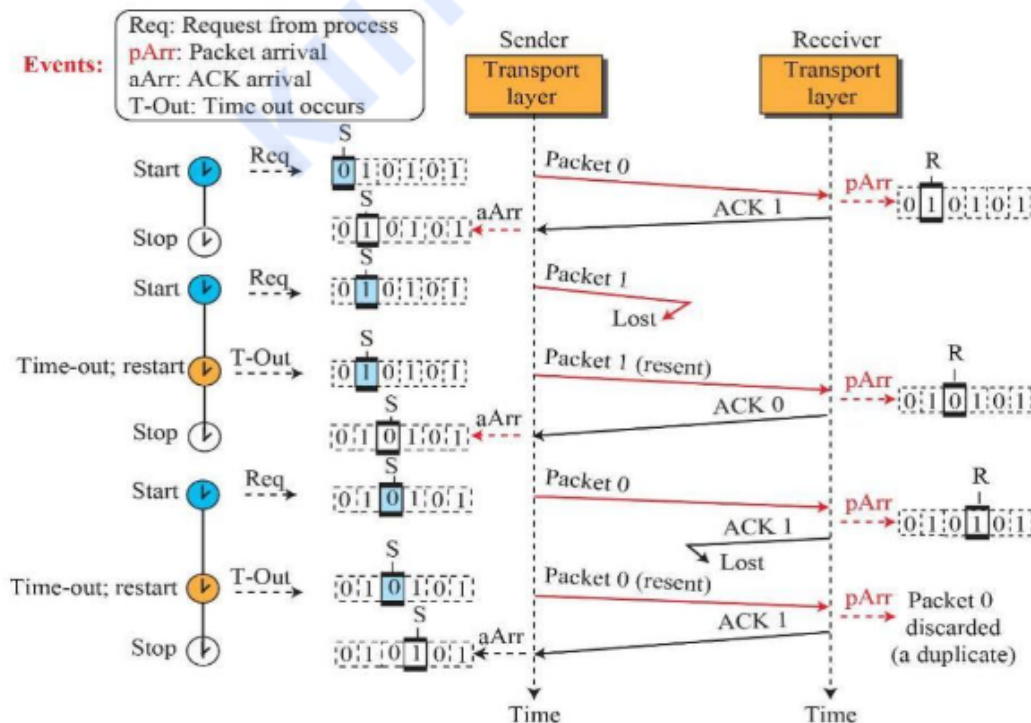
ANS:

4. [2.5+2.5]

(a) Explain the flow diagram of stop and wait protocol with both packet lost and acknowledgment lost scenario.

ANS:

(b) Assume that, in a Stop-and-Wait system, the bandwidth of the line is 1 Mbps, and 1 bit takes 20 milliseconds to make a round trip. What is the bandwidth-delay product? If the system data packets are 1,000 bits in length, what is the utilization percentage of the link?

ANS: Bandwidth of the line = 1 mbps

1 bit takes 20 ms to make a round trip

The length of system data frames = 1000 bits

bandwidth-delay product = $1 \times 10^6 \times 20 \times 10^{-3}$ = 20,000 bits

During the time it takes the data to go from the sender to the recipient and then back again, the device will send 20,000 bits.
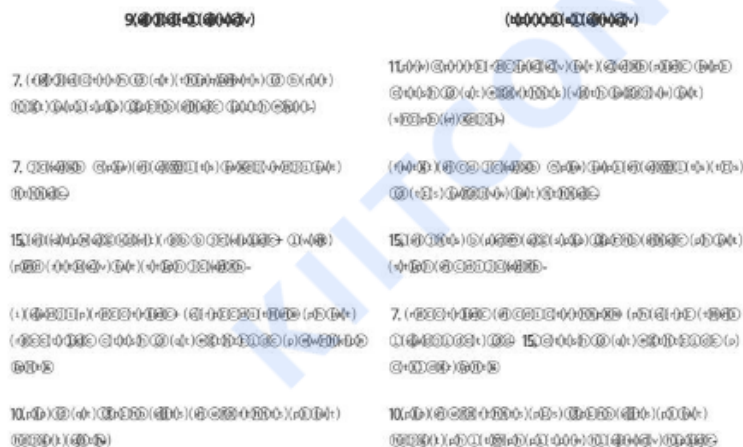
The unit, however, only sends 1,000 bits. We can say that the use of the link is only 1000/20,000, or 5%.

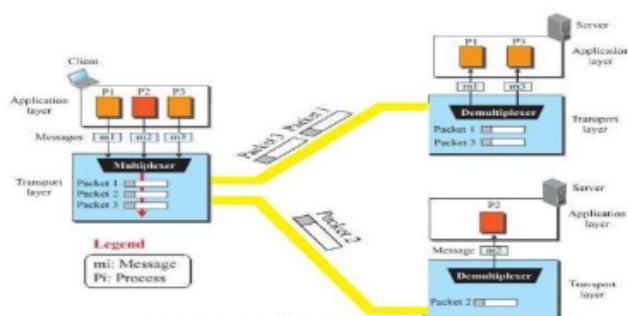5. Short note on any **two**   [2.5+2.5]

(a) Circuit-switching vs packet switching.
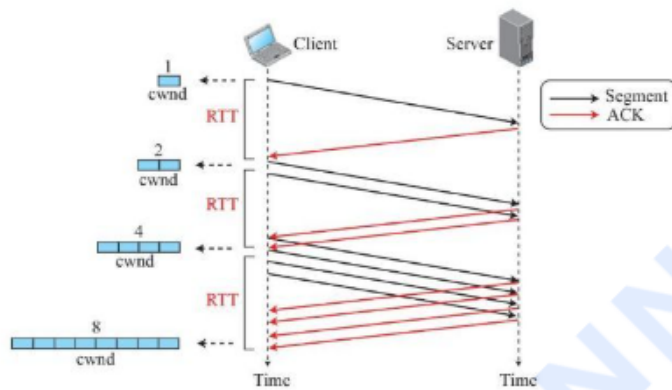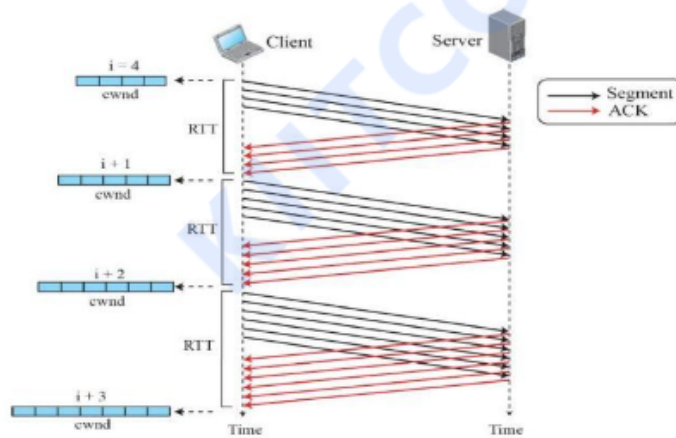
ANS:

(b) Multiplexing vs de-multiplexing.

ANS:

(c) Slow start vs additive increase in congestion control.

ANS:

Slow start:

Additive increase:

*** Best of Luck ***