Jaypee Institute of Information Technology, Noida
T2 Examination, EVEN 2023
B. Tech. (CSE), VI Semester

Course Title: Computer Networks and Internet of Things **Maximum Time: 1 Hr.**
Course Code: 18B11CS311 **Maximum Marks: 20**

After pursuing this course, the students will be able to:
CO1: Defining the basics of networking components and underlying technologies
CO2: Illustrate the various key protocols in OSI model and TCP/IP protocol suite and explain various application protocols.
CO3: Examine various transport protocols and its performance enhancing mechanisms
CO4: Determine the shortest path for the network using various routing protocols and evaluate it
CO5: Choose IP & MAC addressing mechanisms and data link layer protocols to solve communication, error detection and correction problems
CO6: Identification and description of various components, architectures and protocols of Internet of Things (IoT) and their real life problems

Note: Attempt all questions.

Q1. [CO3, CO4] Answer shortly:

(a) [CO4] [1 Mark] Which field of IP header is used to avoid infinite looping of a packet?

(b) [CO3] [1 mark] What will be the sender and receiver window size in case of selective repeat protocol if the 8 bits are used to represent the sequence numbers?

(c) [CO3] [1 Mark] What will be the value of RTO if a retransmission occurs? (Assume RTO = 3.75 ms)

Q2. [CO4] JIIT has the following chunk of CIDR based IP addresses available for distribution: **245.248.128.0/20.** The server manager wants to give half of this chunk of addresses to CSE department, and a quarter to ECE department, while retaining the remaining with himself for future purpose. Answer the following:

(a) Write the valid efficient CIDR allocation of IP addresses to CSE and ECE department. Also, mention the subnet mask in each case. **[2 Marks]**

(b) How many hosts are possible in both departments as CIDR allocated in (a) **[1 Mark]**

(c) Considering, the server manager used IP address from the reserve lot, what will be the broadcast address used by the server manager to send a common message to CSE and ECE department. **[1 Mark]**

Q3. [CO4] [4 Marks] A UDP application writes 2040 bytes of data and further by adding its header send to next lower layer. This data passes through a link with MTU as 576 bytes. Is there a need of fragmentation at the network layer? If yes, then how many fragments are required? Specify, length, offset, MF flag value for each fragment. Calculate the efficiency for sending the required data.

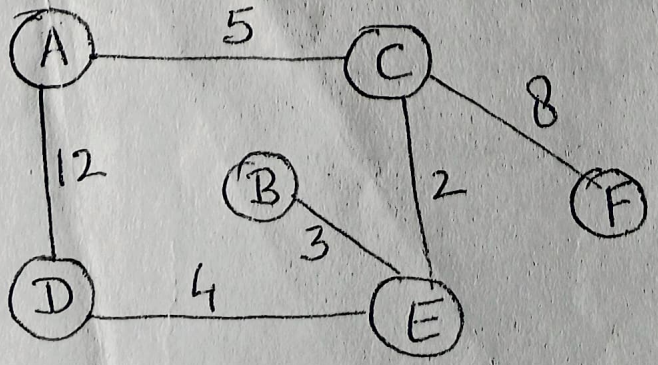
Q4. [CO3] Suppose TCP Tahoe sender "A" wants to send 20 KB file to "B". If, the MSS be 1 KB and CWND (Congestion window) is in slow-start phase initially with ssthresh 6. After exchanging initial sequence numbers between A and B, B announces RWND (Receiver window) size as 1 MSS. Subsequently, receiver window size received by the sender after transmission starts is 1, 2, 4, 2, 8, 5, 3, 1. Three ACKs events occur for segment 12 (Hint: CWND is 8). When 3 ACKs event occur, only the lost packet is retransmitted in the next round. As soon as the packet is received by the receiver. ACK is sent back. When there are back-to-back ACK's only the last ACKs are carrying advertisement of RWND size. Show the entire evaluation process of Congestion window as each segment is sent.

(a) [2 marks] What is the effective window size at the start of the transmission and at the time when 6th packet is being sent by the sender?

(b) [2 marks] In which RTT (Transmission round) the retransmitted 12th segment is being sent?

(c) [2 Marks] Suppose RTT value is 20 seconds, what would be the time when the last segment is being received at B?

Q5. [CO4][3 Marks] For the network below, using the link state algorithm, build the routing table for node D with syntax as (destination, distance, via which node). Assume all link state updates have been distributed.



Enrolment No.

Jaypee Institute of Information Technology, Noida
T1 Examination, Even 2023
B.Tech-III Year, 6th Sem

Course Title: Computer Networks & Internet of Things **Maximum Time: 1 hr**
Course Code: 18B11CS311 **Maximum Marks: 20**

Note: Attempt all Questions

Sr. No	Description
CO1	Defining the basics of networking, components, and underlying technologies
CO2	Illustrate the various key protocols in OSI model and TCP/IP protocol suite and Explain various application protocol.
CO3	Examine various transport protocols and its performance enhancing mechanism
CO4	Determine the shortest path for the network using various routing protocols and evaluate it.
CO5	Chose IP & MAC addressing mechanism and data link layer protocol to solve communication, error detection and correction problems.
CO6	Identification and description of various components, architecture and protocols of IOT and their real-life problems.

Q1: [CO1, CO3] [6 Marks] Answer the following questions briefly:

a) **[CO1] [2 Marks]** Which layer in the TCP/IP stack best corresponds to the phrase:
- "Bits live on the wire"
- "Error Handling from Hop-to-Hop"

b) **[CO1] [2 Marks]** Assume that Host H1 and Host H2 are connected as shown in the below diagram. Determine how many times a packet has to visit Transport & Network layer as defined in TCP/IP model from H1 to H2?

Host H1-----Switch 1-----Router 1-----Router 2-----Switch 2-----Host 2

c) **[CO3][2 Marks]** What is the actual length of the data sent and the value of checksum for the following Hexadecimal format UDP Header: (E29301A2E00407BB)?

Q2: [CO2] [4 Marks] In the following diagram (Fig.1), each domain has a corresponding DNS Server.

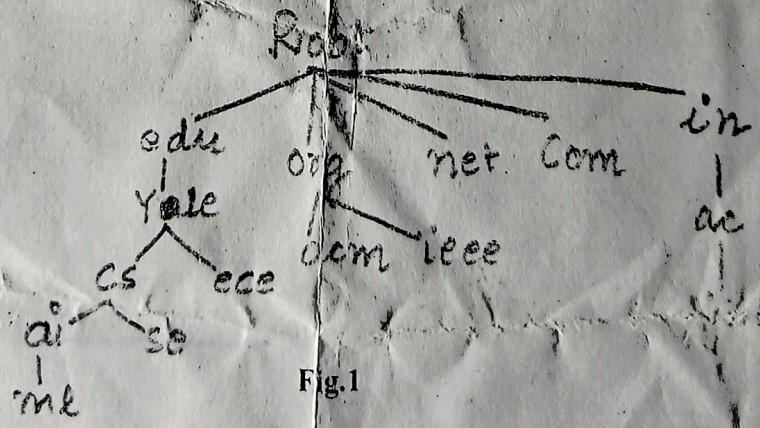


Fig.1

a) **[2 Marks]** Suppose, host jiit.ac.in wants to obtain the IP address of the Host **ml.ai.cs.yale.edu** through a recursive query request. List the sequence of query-response pairs involved in completely resolving the requested domain name.

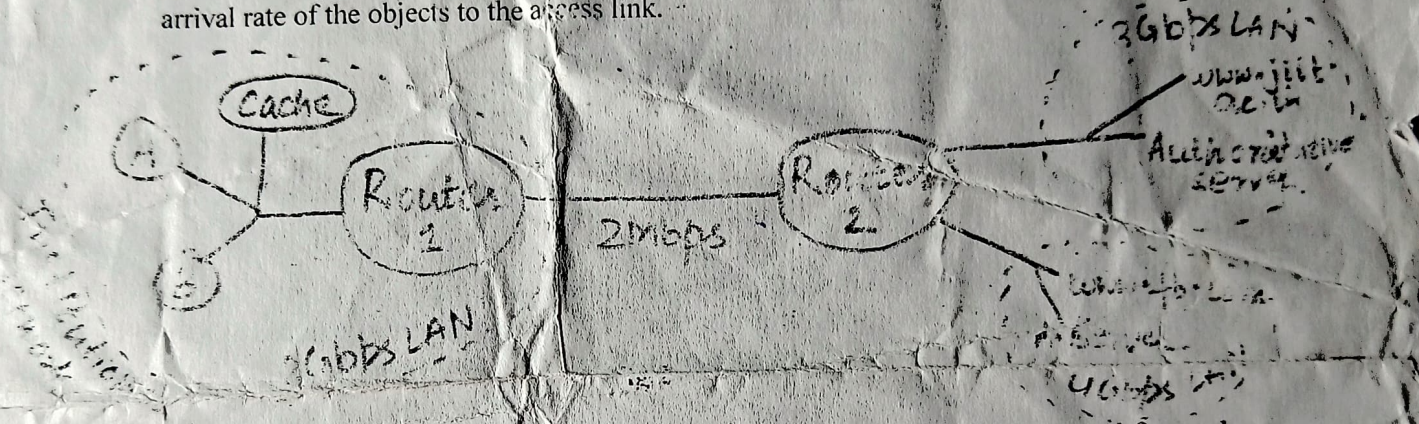
b) **[2 Marks]** What all resource records are placed at TLD to obtain the requested web page. Mentioned in terms of 3 tuples record.

Name	Value	Type

Marks] Consider ... s from web browser for accessing the web page hosted on ... server. The requested web page consists of base HTML file embedded with 6 images, 5 videos, and 2 pdf files.

a) **[3 Marks]** What will be the minimum number of TCP connections required for displaying the requested web page completely on your browser in each case:
   - Non-persistent and persistent connection with no cache implementation.
   - Non-persistent and persistent connection with cache implementation (where browser is requesting the webpage very first time)
   - Non-persistent and persistent connection with cache implementation (where requested webpage ... in cache and no modification is there.)

... Suppose the web cache employed with a cache hit ratio 0.6 at institutional LAN (Fig.2). Find out the total average response time (Access Delay + Internet Delay), if request rate is 14 requests/sec. Assume, each object and HTML file size is of 2KB, Internet delay is of 3 seconds. Note: To model the average response time (A_n) use $A_n = P/1-PQ$, where P is the average time required to send an object over the access link and Q is the arrival rate of the objects to the access link.



Q4 [CO1] [3 Marks] Consider the network with 10 links (L1 to L10), and 6 store and forward switches (R1 to R6). Consider sending a file of size 6Mb from source to destination with back-to-back packets. To minimize queueing delays, packets will be sent on different links. Finally, equal number of packets are transmitted through links L2 and L3. Further, the packets sent on different links are highlighted in Fig.3. **Ignore processing and propagation delays.**
Note: Show all the computations.
Assumptions: File size = 6Mb, Packet size = 1 Mb.
All links are equidistant i.e. distance = ... km, Propagation speed = $2.5*10^8$

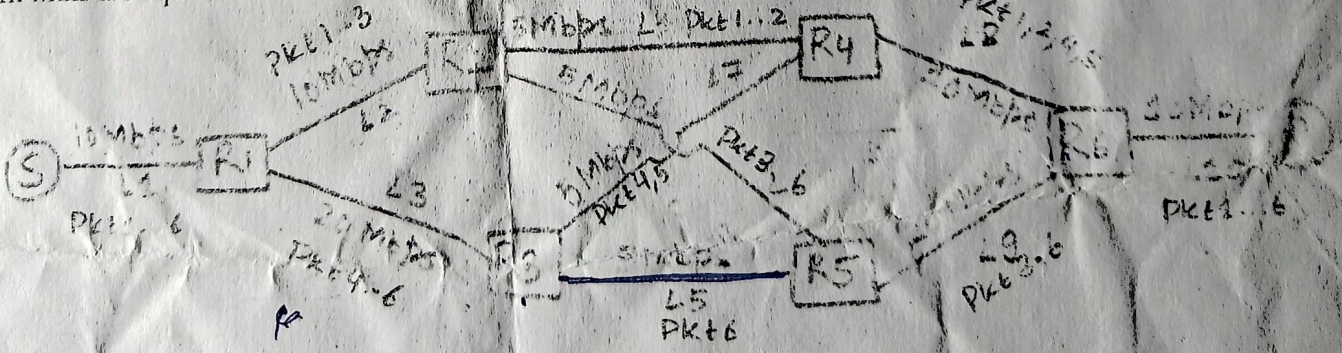


Fig.3

a) **[1 Mark]** How many bits can accommodate on the L5 link at any given time?
b) **[1 Mark]** At what time (in seconds) R2 finish sending all the packets it received?
c) **[1 Mark]** Is there any time lag between packet 3 and 6 received at R5. If yes, how much is the time lag (in seconds)?
d) **[2 Marks]** What is the time in second, required to receive the file completely at "D"?