LT3-56 LT4-56
LT5-52 LT7-52

POSSESION OF MOBILES IN EXAM IS UFM PRACTICE.

Name _____ 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
Course Code: 18B11CS311 **Maximum Time: 1 hr**
Note: Attempt all Questions **Maximum Marks: 20**

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.

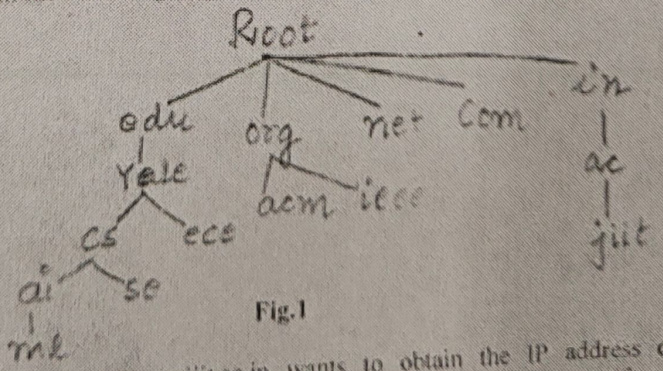

Fig.1

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

BDJ-51
CSA-60

Q3 [CO2] [5 Marks] Consider user A requests from web browser for accessing the web page hosted on JIIT 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 already exists in cache and no modification is there.)

b) **[2 Marks]** 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.

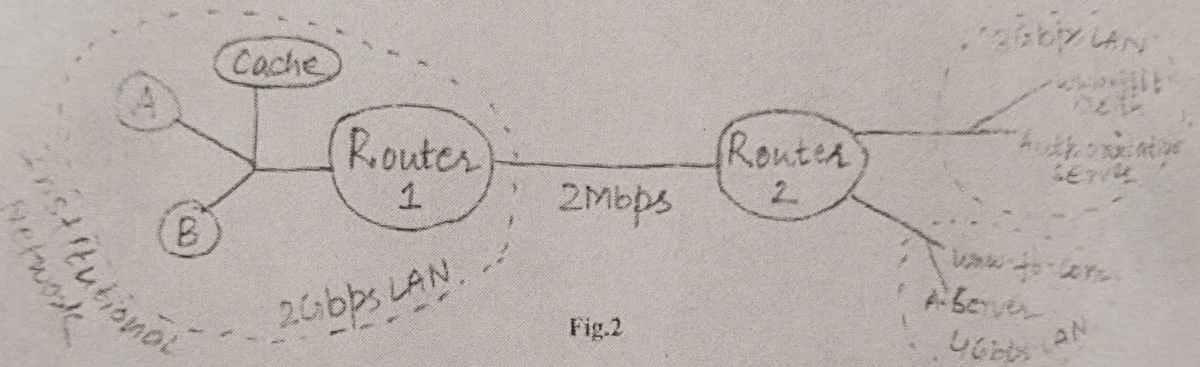

Fig.2

Q4: [CO1] [5 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. Firstly, 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 = 200 km, Propagation speed = $2.5*10^8$

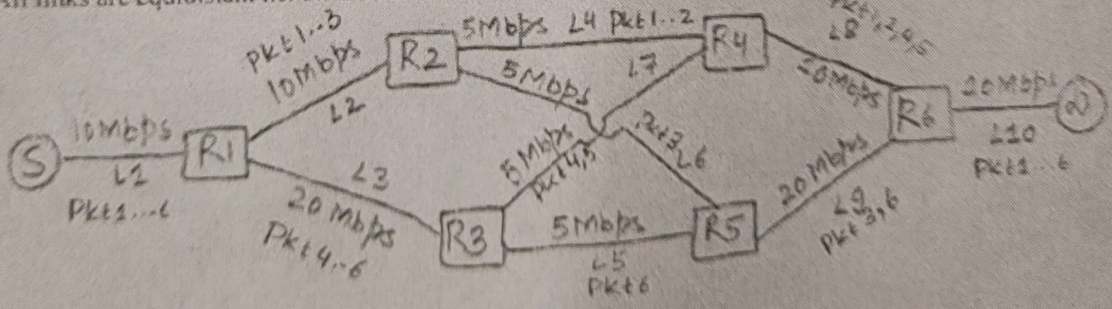

Fig.3

a) **[1 Mark]** How many bits can accommodate on the L5 link at any given time? 10000 bits
b) **[1 Mark]** At what time (in seconds) R2 finish sending all the packets it received? 0.8 Sec
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)? Yes Pkt3 at 0.85 & Pkt6 at 1.05 Sec, time lag = 0.2 Sec
d) **[2 Marks]** What is the time in seconds required to receive the file completely at "D"? 1.2 Sec

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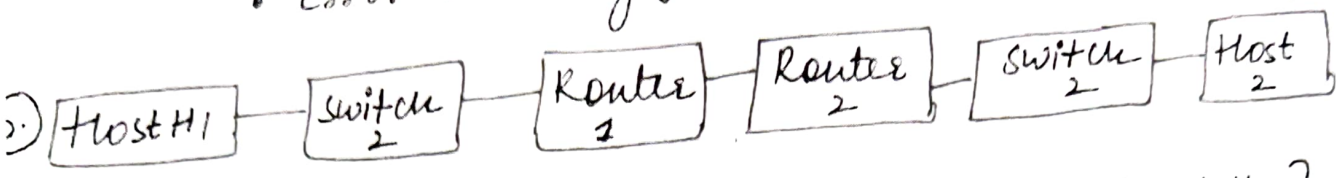
Date : 22/02/23

Ans-1 :→ (a) : "Bits Live on the Wire" : Physical layer 1 Mark

: "Error Handling from Hop to Hop" : Data Link layer 1 Mark

b) 

1 mark Transport layer : 2 Times [at Host H1 & Host H2]

1 mark Network layer : 4 Times [at Host H1, at R1, at R2, H2]

c) UDP Header Dump :→ E2301A2 E004 07BB

∴ Total length of Data = $[E004]_{16} = 14\times16^3 + 0\times16^2 + 0\times16^1 + 4\times16^0$

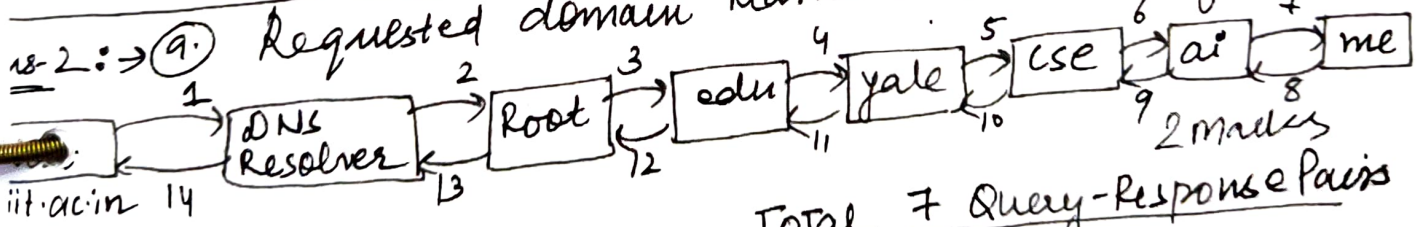
$= (57348)_{10}$ 0.5 mark

Now, 8 bytes of Header

∴ Actual length = 57348 − 8 = 57340 0.5 mark

∴ checksum :→ $[07BB]_{16} \Rightarrow 1979$ 1 mark

Ans-2 :→ (a) Requested domain Name : ml.ac.cs.yale.edu



2 marks

"Recursive Approach"

Total 7 Query-Response Pairs

b) Any TLD have 2 Resource Records :→ NS, A

Name	Value	Type	
ml.ac.cs.yale	Authoritative Server Name (yale)	NS	1 mark
Authoritative Server Name (yale)	IP address	A	1 mark

Ans-5:→ (a.) • Non-Persistent & Persistent with Pipelining

0.5 mark Non-Persistent :→ 14 TCP Connections
[13 For Objects + 1 for Reference Page]

0.5 mark Persistent : 1 TCP Connection for all.

• Non-Persistent & Persistent with Cache implementation
[Where Browser is Requesting webpage very First Time]

0.5 mark Non-Persistent: 14 [It is first Request from Browser]

0.5 mark Persistent : 1

• Non-Persistent & Persistent with Cache Implementation
[Where requested webpage already exists in Cache & No modification is there]

0.5 mark Non-Persistent : 1

0.5 mark Persistent : 1

[only 1 TCP Connection required for Condional get request since there is No modification, the cached copy will be displayed]

(b.) Given :→ Cache Hit Ratio = 0.6, Internet delay = 3 sec.
Request Rate = 14 Req/sec
Object Size = 2KB

Now, Total Response delay (with cache) = Hit Ratio [LAN delay] + Miss Ratio [LAN + access + internet delay]

* LAN delay Ignore [as mentioned in Ques.]

Now, Total Average Response delay = miss ratio [access delay + internet delay]

Average Access Delay = $\frac{P}{1-PQ} = \frac{L/R}{1-\frac{aL}{R}} = \frac{2\times10^3\times8/2\times10^6}{1-14\times\frac{2\times10^3\times8}{2\times10^6}}$ 1 mark

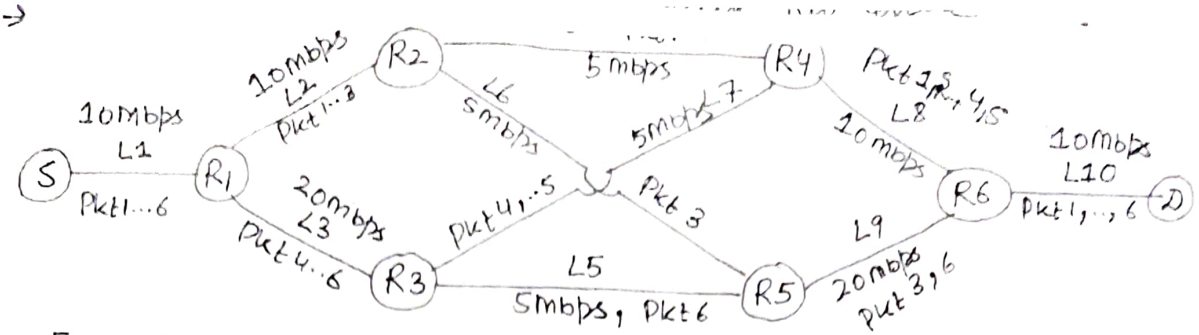
$\doteq \frac{0.008}{1-(1-0.4)\times0.112}$

∴ Access delay = 0.00837 sec.

Total delay = (0.4)[0.008 + 3 Sec]

1 Mark ⇒ 0.4 [3.008 sec] ⇒ 1.2 Seconds.

ns-4 :→



Given: File Size = 6 mb , ∴ 6 Packets , Packet Size = 1 mb

: Transmission Delay For each Packet (1 mb) : → L/R

low, delay for each Packet on Individual Link are as follows:

L1 = $10^6/10\times10^6$ = 0.1 sec , L4-L7 = 0.2 sec , L10 = 0.1 sec

L2 = $10^6/10\times10^6$ = 0.1 Sec , L8 = 0.1 Sec ,

L3 = $10^6/20\times10^6$ = 0.05 sec , L9 = 0.05 sec .

ckets	Source		R1		R2		R3		R4		R5		R6		D
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	
1	0	0.1	0.1	0.2	0.2	0.4			0.4	0.5			0.5	0.6	
2	0.1	0.2	0.2	0.3	0.4	0.6			0.6	0.7			0.7	0.8	
3	0.2	0.3	0.3	0.4	0.6	0.8					0.8	0.85	0.9	1.0	
4	0.3	0.4	0.4	0.45			0.45	0.65	0.7	0.8			0.8	0.9	
	0.4	0.5	0.5	0.55			0.65	0.85	0.85	0.95			1.0	1.1	
6	0.5	0.6	0.6	0.65			0.85	1.05			1.05	1.1	1.1	1.2	

(a) No. of bits which can accomodate on L5 Link = Bandwidth × Dela

∴ No. of bits = $5\text{ Mbps} \times \frac{200\text{km}}{2.5\times10^8}$ = 4000 bits 1 mark

(b) At 0.8 sec 1 Mark

(c) Yes Pkt 3 at 0.85 sec and Pkt 6 at 1.05 sec Time lag = 0.2 sec
1 Mark

(d) At 1.2 Sec file is fully recieved at destination "D".
2 Mark

* Give Marks if formtation is Shown.