

University Rajshahi
Department of Computer Science and Engineering
B.Sc. (Engg.) Part-III, Odd Semester, Examination 2018
Course: CSE 3151 (Computer Networks)

Time: 03 Hours Full Marks: 52.50

ANSWER ANY THREE FROM EACH SECTION

SECTION A

- | | |
|---|------|
| 1.(a) ✓ How the term <i>Computer Network</i> is defined in literature? 2020 1-a,b,c | 1.75 |
| ✓ (b) Is <i>Computer Network</i> different from <i>Distributed System</i> ? Explain how. | 3 |
| ✓ (c) Can we classify computer network by its' scale? How? | 3 |
| (d) Write the name of the layers suggested by OSI reference model in appropriate order.
1-3 p-8 | 1 |
| | |
| 2.(a) ✓ What is framing? Explain the <i>Flag bytes with byte stuffing</i> mechanism for framing. wk 4-1 | 3 |
| ✓ (b) Explain how <i>Hamming Code</i> can be used as error correction mechanism? wk 4-1 pg-16 | 4.75 |
| ✓ (c) Can you explain the mechanism of data transfer of <i>Relaying in space</i> and <i>Relaying on ground</i> for satellite communication? Cn book pg- 123 note copy 38 | 1 |
| | |
| -3.(a) What is meant by static channel allocation and dynamic channel allocation? wk 3-1 pg-5-10 | 2 |
| (b) What are the assumption of dynamic channel allocation? wk 3-1 pg-10 | 2 |
| ✓ (c) Explain the basic bitmap protocol as a Collision free protocol with necessary figures. Ru solve pg-12, 13 note copy 38 | 4.75 |
| | |
| 4.(a) We are going to establish a computer network with 6 subnets and each subnet will contain at least 30 PCs. Let network ID is 192.168.2.0. Design the IP addressing for the proposed network. ru note page- 41 | 2.75 |
| (b) For the above scenario described in question 4(a), if we want to increase PCs up to 100 per subnet and decrease sub network into 4, then what type of IP addressing scheme might work best. Explain your argument. ru note page- 39 | 3 |
| (c) Differentiate between sub netting and super netting. ru note page- 40 | 3 |

SECTION B

- 5.(a) Distinguish between adaptive and non-adaptive routing algorithm. [Ru note pg-65](#) 2.75
 (b) Explain Optimality Principle. [Ru note pg-64](#) [CN book -364](#) 2
(c) How the distance vector routing algorithm works? [Ru note pg-63](#) [CN book -370](#) 4
- 6.(a) Can you explain the three-way handshake mechanism for establishing a connection in TCP? [ru note -9](#) 3
 (b) What is meant by connection oriented and connection less communication? [ru note -6](#) 1.75
 (c) How connection is released in TCP? Why is the mechanism made such complex instead of just releasing connection? 4
- 7.(a) Can you explain the lossless and the lossy compression mechanism? [ru note-4](#) 2
(b) Explain how the run length encoding compression technique works [ru note-3](#) 2.75
(c) What is directory server? Explain its job. [ru note-2](#) 2
(d) Elaborate the following terms: DHCP, ARP, DNS, SMTP [ru note-1](#) 2
- 8.(a) What are the purposes of using *IHL* and *type of service* fields in IPv4 header? 3
(b) (i) A packet has arrived with an M bit value of 0. Is this the first fragment, the last fragment, or a middle fragment? 2
(ii) A packet has arrived with an M bit value of 1 and a fragmentation offset value of zero. Is this the first fragment, the last fragment, or a middle fragment?
(c) A host with IP address 192.168.10.20 and physical address A2:B2:C2:D2:E2:F2 has a packet to send to another host with IP address 172.16.10.1 and physical address A3:B3:C3:D3:E3:F3 (which is unknown to the first host). The two hosts are on the same Ethernet network. Show the ARP request and reply packets encapsulated in Ethernet frames. 3.75

University of Rajshahi

Department of Computer Science and Engineering

B.Sc. (Engg.) Part III Odd Semester Examination-2017

Course: CSE 3151(Computer Networks)

Marks: 52.5

Time: 3 Hours

[N.B. Answer any SIX questions taking THREE from each section]

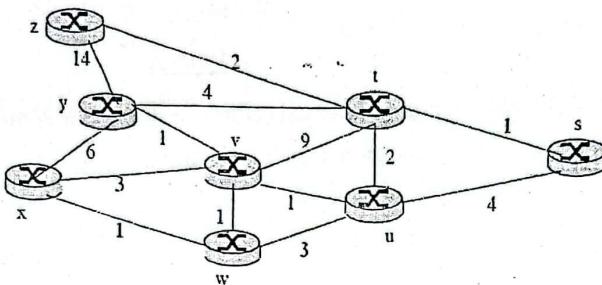
Part-A

1. (a) Draw a neat labeled diagram of the OSI reference model for computer networks showing all the layers and the communication subnet boundary. **1-3 p-8** 1.75
- (b) What are the reasons for using layered protocols? **22nd page note copy** 2
- (c) What is X.25 protocol? Explain the functionality of X.25. **ICE lecture-5 Ru-2-2 22page copy** 3
- (d) Distinguish between Frame Relay and X.25 protocol. **copy p-23** 2
<https://www.geeksforgeeks.org/comparison-between-x-25-and-frame-relay/>
2. (a) What is vulnerable period? Explain how Ethernet's carrier sense multiple access with collision detection (CSMA/CD) works. **2019 2d RU copy pg-27 to 33** 2.75
copy-29b
- (b) How throughput is improved in slotted ALOHA over pure ALOHA? **ICE lect- 4 pg6-13** 1
- (c) What are the different types of cabling supported by Ethernet standard? 1
- (d) Suppose a 100 Mbps CSMA/CD protocol in which the maximum one-way propagation delay between any two hosts is 100×10^{-6} sec. What will be the minimum size of a transmitted frame if the transmitting node to detect a collision before completing the transmission of the frame? 2
- (e) What is Ethernet's exponential backoff? In what situations contention based MAC protocols are suitable? 2
3. (a) **wk4-1 pg-16-21** Describe hamming code technique with example for detecting and correcting single bit error. 4
- (b) Find out the CRC encoded codeword for the dataword 1101. You can choose any Generator polynomial $G(x)$ as you like for CRC encoding. **wk4-1 pg-26** 3
- (c) Briefly explain the difference between single-bit errors and burst errors? **wk-4-1 pg-12** 1.75
4. (a) What do you mean by Netid and Hostid? How can we find the class of an address when the address is given in dotted decimal notation? **ru note copy- pg-46-44** 3.75
- (b) Define classless IP addressing with example. **ru note copy- pg-43** 2
- (c) Suppose, A host is given the 192.168.3.219 /27 IP address. Indicate the network address, the broadcast address and the total number of hosts available in the network.? **my note pg-49** 3

Part-B

5. (a) Differentiate between routing and forwarding. Why link state protocol is not used for interdomain routing, or routing for the entire Internet? Ru note- 73 2.75

- (b) Consider the following network with the indicated link costs. Use Dijkstra's shortest path algorithm to compute the shortest path from node x to all network nodes. Show how the algorithm works by computing a table. 2.5



- (c) Consider sending a packet from a sending host to a receiving host over a fixed route. List the delay components in the end-to-end delay computation. Which of these delays are constant and which are variable? my note -56 b 2

- (d) How is the 16-bit IP checksum field calculated? ru note-59 1.5

- 6.** (a) Explain the key functions of the Transport layer, including reliability, port addressing, and segmentation. 2.75

- (b) What is sliding window protocol? Which protocol – Go-Back-N or Selective-Repeat – makes more efficient use of network bandwidth? Why? 2

- (c) Can a connection-oriented, reliable message transfer service be provided across a connectionless packet network? Explain. 2

- (d) Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110. 2

- i How much data is in the first segment?
- ii Suppose the first segment is lost but the second segment arrives at B. In the acknowledgement that Host B sends to Host A, what will be the acknowledgement number?

- 7.** (a) Explain Three-Way Handshake Mechanism used by TCP to terminate a Session reliably. 2

- (b) Consider an http client that wants to retrieve a WWW document at a given URL. The IP address of the http server is initially unknown. The WWW object at the URL has one embedded GIF image that resides at the same server as the original object. What transport and application layer protocols besides http are needed in this scenario? 2

- (c) What is the difference between end-to-end delay and packet jitter? What are the causes of packet jitter? 2.75

- (d) What is the primary function of the ICMP protocol? Give an example situation where it would be used in the Internet. 2

8. (a) What is the difference in the service offered to applications by the TCP and UDP protocols? For each of the following applications determine whether you would use TCP or UDP and explain the reasons for your choice. 4.75

- i) File transfer ii) Watching a real time streamed video iii) Web browsing

- (b) Describe the working principle of SMTP protocol. 4

Time: 3 Hrs.

[Answer any six (06) questions taking three (03) from each section.]

Part A

1. (a) Explain broadcast, multicast, unicast and point-to-point transmission technology with examples. [wk1-2 pg-14, 16](#) 3
- (b) What are the basic responsibilities of physical layer, data link layer, network layer and transport layer? [wk1-3 pg- 9, 10, 12, 13](#) 2
- (c) Discuss the technical characteristics of selecting a cable that you should consider. 3.75
2. (a) Compare the advantages and disadvantages of Permanent Virtual Circuit (PVC) over Switched Virtual Circuit (SVC). [wk2-2 pg-19](#) 2
- (b) Let us consider a virtual circuit having three switches. Explain how VCI and port numbers are updated during the request and acknowledge phases of virtual circuit setup process. You can consider any arbitrary port number and VCI. <https://youtu.be/P2TgZCRFmIo> 3
- (c) Differentiate the characteristics of UTP, STP and Coaxial cables. [my copy pg-31b](#) 3.75
3. (a) In distance vector routing algorithm, consider the five-node (linear) network of Fig.-1, where the delay metric is the number of hops. Write the routing table entries at router B, C, D and E for router A and first 5 exchanges of the cases: (1) A is down initially and all the other routers know this, then A comes up; (2) All routers are initially up and suddenly A goes down. [book-372](#)
[copy-39](#) 3

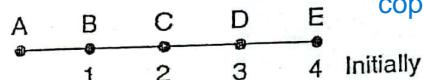
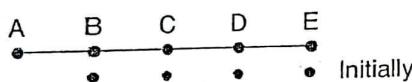


Fig.-1: (Left one for case 1 and right one for case 2).

- (b) An IP packet has arrived with the first 8 bits as, $\leftarrow 01000010$. However, the receiver discards the packet. Why? [book-forouzan-566 my copy-39b](#) 2
- (c) An IP packet has arrived with the first few hexadecimal digits as shown below
 $\leftarrow 45000028000100000102 \dots$ [book-forouzan-566 mycopy-40](#)
 How many hops can this packet travel before being dropped?
- (d) A packet has arrived with an M bit value of 0. Is this the first fragment, the last fragment, or a middle fragment? Do we know either the packet was fragmented or not? [book-forouzan-571 mycopy-40b](#) 1.75

4. (a) A novice network engineer (NNE) is thinking to set the following subnet masks to three networks on an internet. What is the maximum number of hosts each network will be able to handle? Give proper explanation of your answer.

NetA: 255.255.255.240, NetB: 255.255.128.0 and NetC: 255.230. 0.0

- (b) Assume that a router named as Router1, has the following entries in its routing table: 7.5

Type	Network	Port	Next Hop
Connected	20.0.0/8	Interface 0 [20.0.0.1/8]	---
Connected	11.11.0.0/16	Interface 1 [11.11.0.1/16]	---
Connected	11.12.0.0/16	Interface 2 [11.12.0.1/16]	---
Connected	172.18.1.0/24	Interface 3 [172.18.1.1/24]	---
Static	135.46.56.0/22	---	Router2 [20.0.0.2/8]
Static	135.46.60.0/22	---	Router3 [11.11.0.2/16]
Static	192.53.40.0/22	---	Router4 [11.12.0.2/16]
	Default	---	Router5 [172.18.1.2/24]

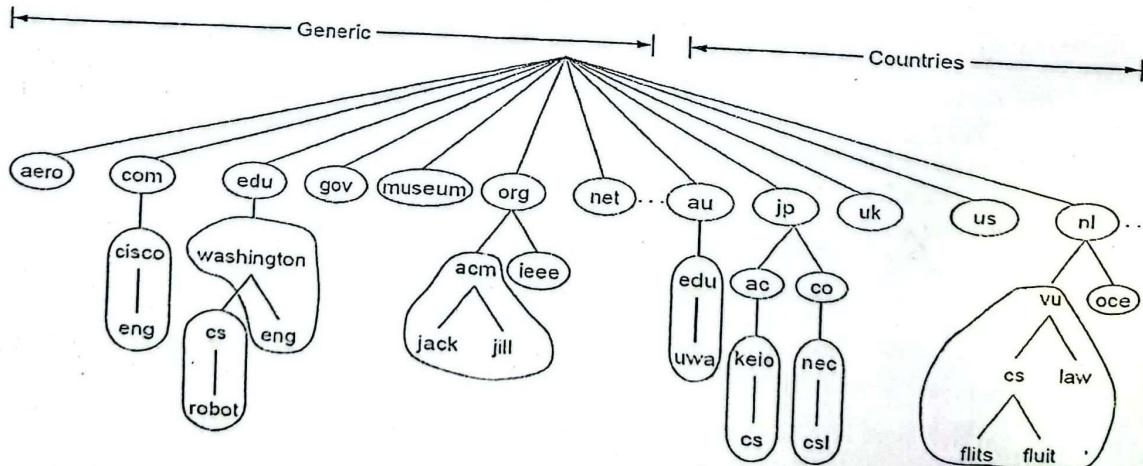
Which port should be used by Router1 if a packet for each of the following destination addresses arrives?

- (a) 135.46.63.10; (b) 135.46.57.14; (c) 135.46.52.2; (d) 192.53.40.7; (e) 192.53.56.7

Part B

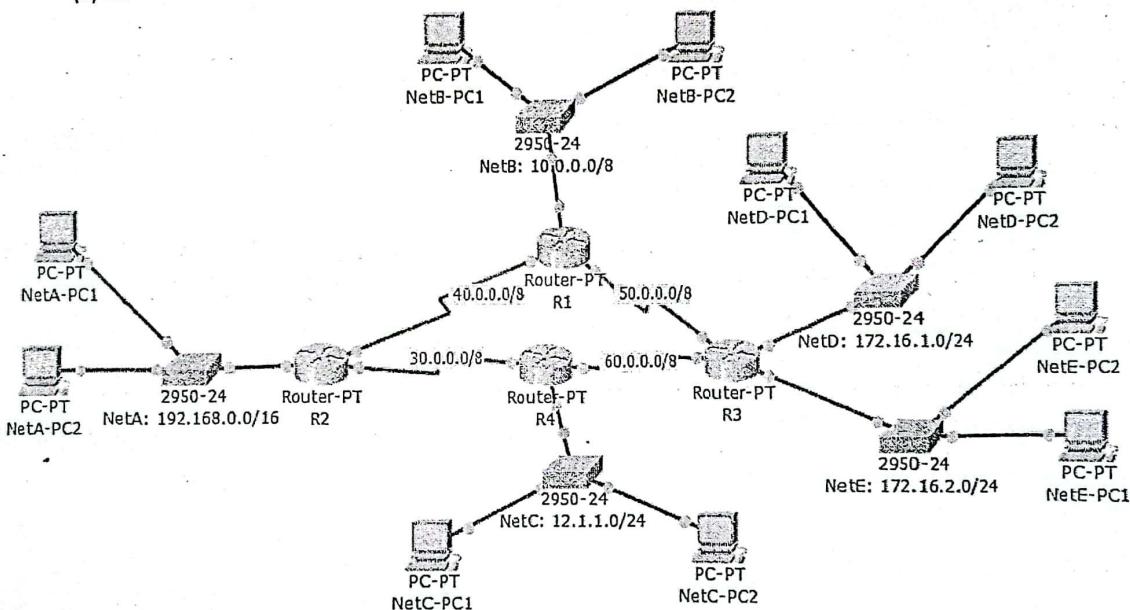
5. (a) Find out the hamming code for the data 11011110. [my note -57](#) [my note -57b](#)
 (b) What is a burst error? Let there are 4 codewords, each having the capacity for a single error correction. Explain how you can handle a situation where a burst error corrupts 4 bits. [ICE lecture-9 pg-3](#)
 (c) Explain the advantages of two-dimensional parity-check code. [my note -58](#)
6. (a) Explain with a diagram how CSMA/CD works. [ICE lecture-4 pg-26](#)
 (b) Discuss how an ICMP can calculate the roundtrip time between a source and a destination.
 (c) What is *half-close* in the termination of TCP connection? Give an example of situation where you need *half-close*. Explain how *half-close* works, where you can consider any arbitrary segment number and acknowledge number as you require. [my note pg-64](#) 4.
7. (a) What do you understand by *socket*?
 (b) Modify the TCP protocol as given below for releasing a connection between two users so that the following three cases could be handled.
- Protocol:** One of the users sends a DR (*Disconnection Request*) TPDU (*Transport Protocol Data Unit*) to initiate the connection release. When it arrives, the recipient sends back a DR TPDU, too, and starts a timer, just in case DR is lost. When this DR arrives, the original sender sends back an ACK (*Acknowledgement*) TPDU and releases the connection. Finally, when the ACK TPDU arrives, the receiver also releases connection. Releasing connection means that the transport entity removes the information about the connection from its table of currently open connections and signals the connection owner.
- Case-1:** Final ACK TPDU is lost.
Case-2: DR is lost.
Case-3: Repeated DRs are lost.
- (c) Write down the differences between IPv4 and IPv6 address.

8. (a) Is it possible that:
 i) A machine with a single DNS name has multiple IP addresses?
 ii) A machine having two DNS names fallen in different top-level domains?
 iii) Two different machines having two different IP addresses have same domain name?
 Justify your answers. 1.75 6
- (b) In order to avoid problems, the DNS name space is divided into non-overlapping zones and each zone contains name servers (i.e., DNS server) holding the information about that zone. Assume that the following figure is a part of the divided DNS name space where each zone has only one name server. Now what would happen if a host `robot.ai.cs.yale.edu` wants to know the IP address of the host `pc24.cs.keio.ac.jp`? 2.75



Section A

- 1(a) Define computer network and distributed system. [copy pg-5](#) 1.75
- (b) In the standard Ethernet, if maximum propagation time is 26.6 micro-second, what is the maximum size of Ethernet frame? 3.5
- (c) Define port address, logical address, and physical address. 3.5
- 2(a) What are the differences between Intranet and Extranet? [my note-32a](#) 2.75
- (b) Assume that in the following internet, IP addresses have been already set to each PC and router. Now write commands to configure routers for 6
- (i) Static routing
 - (ii) RIP



- 3(a) Suppose, the IP address of a host of a network is 192.168.12.123 and a subnet mask of that network is 255.255.255.240, what are the network address, default gateway IP, broadcast IP, IP of the first host and last of that network? [my copy-41](#) 4
- (b) Explain how to increase transmission rate from 10 Mbps to 100 Mbps in Fast Ethernet. 2.75
- (c) What are the differences between IPV4 and IPV6? 2
- 4(a) Using Dijkstra algorithm, find shortest path between sources C to destination G of following figure 4.1. Draw and List all the states of the graphs in computing the final route to destination. [my note pg-50](#) 4.75
- (b) What will be link state packets of all the routers of the following network of figure 4.2? [my copy pg-51b](#) 4

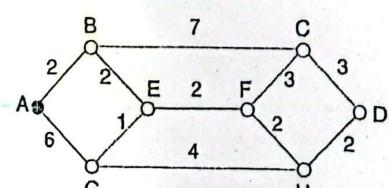


Fig. 4.1

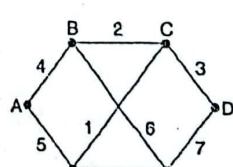
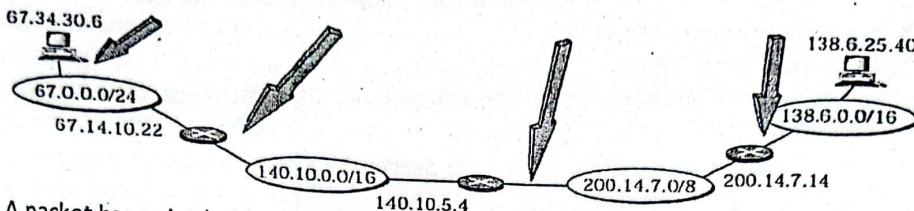


Fig. 4.2

Section B

- 5(a)** Show values in the options fields of IP packet for Strict source route for the following network

Solve soon



my note-56b 57

- (b)** (i) A packet has arrived with an M bit value of 0. Is this the first fragment, the last fragment, or a middle fragment? (ii) A packet has arrived with an M bit value of 1 and a fragmentation offset value of zero. Is this the first fragment, the last fragment, or a middle fragment?
- (c)** A host with IP address 192.168.10.20 and physical address A2:B2:C2:D2:E2:F2 has a packet to send to another host with IP address 172.16.10.1 and physical address A3:B3:C3:D3:E3:F3 (which is unknown to the first host). The two hosts are on the same Ethernet network. Show the ARP request and reply packets encapsulated in Ethernet frames. 3.75

- 6(a)** What do you mean by Netid and Hostid? How can we find the class of an address when the address is given in dotted decimal notation? my note-65 4
- (b)** How many layers are considered in a router and why? 2
- (c)** What are the purposes of using IHL and type of service fields in IPv4 header? ru note-60 2.75

- 7(a)** Explain the difference between single mode and multimode optic fiber. What are the advantages and disadvantages of single mode and multimode optic fiber? Which technical parameters will you consider in purchasing optic fiber connector? 4
- (b)** Explain the following framing method (i) Flag bytes with byte stuffing and (ii) Flag bits with bit stuffing. 2.75
- (c)** What is loopback address and private address? 2
- 8(a)** Explain with examples the Fully Qualified Domain Name (FQDN) and Partially Qualified Domain Name (PQDN)? 2
- (b)** What are the zone and domain used in DNS? 2
- (c)** Why does FTP need two TCP connections? What do you mean by active mode and passive mode of FTP? 2.75
- (d)** What are the advantages of using DHCP server? 2

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(Answer any SIX questions taking THREE from each part)

Part A

- | | |
|--|------|
| 1(a) What do you mean by computer network and internet? | 2 |
| (b) Briefly describe the OSI reference model. wk-1-3 pg-7 to 18 | 4 |
| (c) Compare between TCP/IP and OSI reference model. copy pg-25 | 2.75 |
| 2(a) Explain clearly the advantages and disadvantages of ATM Permanent Virtual Circuit (PVC) over Switched Virtual Circuit (SVC)? | 3 |
| (b) Explain clearly the advantages of ATM over Frame Relay and Frame Relay over X.25 protocol? | 3 |
| (c) How does ATM accommodate video streaming in a fixed ATM cell? Explain with header diagram of ATM. | 2.75 |
| 3(a) Given the IP address of 193.243.12.93 and a subnet mask of 255.255.255.128, what is the network address? | 1 |
| (b) Assign IP address to the subnets of different labs of CSE department using a class C private IP block. Let, the CSE department has five labs, there are 11 PCs in Lab 1, 7 PCs in Lab 2, 44 PCs in Lab 3, 64 PCs in lab 4 and 3 PCs in Lab 5. List the network IP, broadcast IP, first host IP and last host IP of each lab. | 5 |
| (c) Explain, with the help of internal diagram, the technical differences between a network hub and switch. | 2.75 |
| 4(a) In distance vector routing algorithm, consider the five-node (linear) network of Fig. 1, where the delay metric is the number of hops. What will be the routing table entries at router B, C, D and E for router A, for first 5 exchange for the cases (1) A is down initially and all the other routers know this, then A comes up (2) All routers are initially up and suddenly A goes down. | 3 |

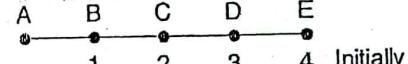
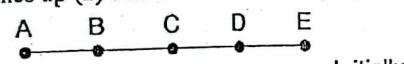


Fig. 1 (left one for case 1 and right one for case 2)

2016 3a

- | | |
|--|------|
| (b) Draw the sink tree for router B of Fig. 2 | 2 |
| (c) The Fig. 3 shows an autonomous system with seven networks and four routers. Considering routing information protocol (RIP), derive the table of each router containing three fields Destination, cost(hop count) and IP of the next node | 3.75 |

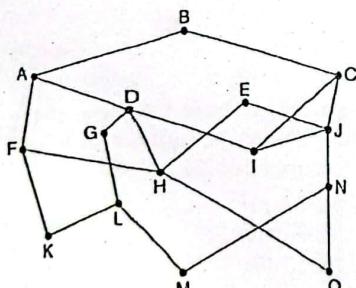


Fig. 2

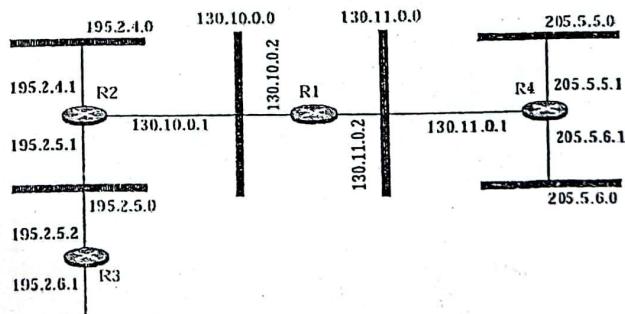


Fig. 3

Part B

- Solve soon
- 5(a) What are the advantages of IEEE 802.11g standard over IEEE 802.11a? 3
(b) What are the advantages of slotted ALOHA? 2
(c) A host with IP address 130.23.43.20 and physical address B2:34:55:10:22:10 has a packet to send to another host with IP address 130.23.43.25 and physical address A4:6E:F4:59:83:AB (which is unknown to the first host). The two hosts are on the same Ethernet network. Show the ARP request and reply packets encapsulated in Ethernet frames. 3.75
- 6(a) To guarantee the correction of up to t errors in all cases, what will be the minimum Hamming distance in a block code? Find the Hamming distance between the following code block set: 2.75
(i) 01000, 10111 (ii) 111001, 111000
(b) Find out the hamming code for the data 11000010. *my note -66-67*
(c) Find out the CRC encoded codeword for the dataword 1001. You can choose any Generator polynomial G(x) as you like for CRC encoding. 3
- 7(a) Explain the underlined parameters of the following result of a ICMP packet found for the command "ping www.ru.ac.bd": 2
PING www.ru.ac.bd (68.168.78.100) 56(84)bytes of data.
64 bytes from www.ru.ac.bd (68.168.78.100): icmp_seq=0 ttl=48 time=85.4 ms
(b) Explain how can a ICMP calculate the roundtrip time between a source and a destination? 2
(c) Suppose a TCP connection is transferring a file of 5000 bytes. The first byte is numbered 10001. What are the sequence numbers for each segment if data is sent in five segments, each carrying 1000 bytes? 2.75
(d) What will happen in a TCP connection when (i) a segment is lost and (ii) acknowledgment is lost? 2
- 8(a) What is MIME? Why it is used. 2
(b) Describe the working principle of SMTP protocol. 3.75
(c) Describe about TELNET and Remote-Login. 3