NETWORKING
PAST PAPER

(*) 10.66.5.99   255.255.254.0

Sol

10.66.5.99   (11111111.11111111.11111110.00000000)

CLASS A

No. OF NETWORK BITS = 8.

" " SUBNET BITS = 15

" " HOST " = 9

" " SUBNETS IN NETWORK = $2^{(\text{SUBNET BITS})} = 2^{15} = 32768$

" " HOSTS PER SUBNET : $2^9 = 512 - 2 = 510$

(*) 192.168.55.55 , 255.255.255.224

(11111111.11111111.11111111.11100000)

CLASS : C

NETWORK BITS = 24

SUBNETBITS = 3

HOST " = 5

No. OF SUBNETS IN NETWORK = $2^3 = 8$

" " HOSTS PER SUBNET = $2^5 - 2 = 32 - 2 = 30$.

(*) 123.30.40.166 /26

CLASS: A

NETWORK BITS = 8

SUBNET " = 18

HOST " = 6

No. OF SUBNETS = 262,144 = (2^{18})

" " HOSTS PER SUBNET = $2^6 - 2 = 64 - 2 = 62$

(x) 192.168.203.18 /29

Class C

No of Network Bits = 24

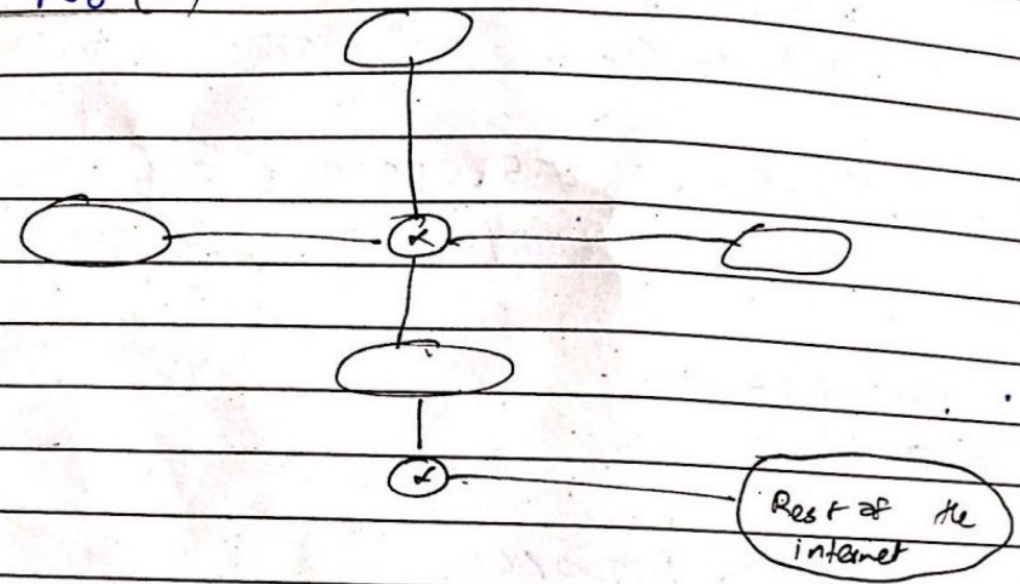
No of Subnet Bits = 5

No of Host Bits = 3

No of Subnet in Network = $2^5 = 32$

No of Host Per subnet = $2^3 = 8 - 2 = 6$

Question N6 (a)



Mask	Network Address	Next Hop	Interface
26	180.70.65.192/26	-	m2
25	180.70.65.128/25	-	m0
24	201.4.22.0/24	-	m3
22	201.4.16.0/22	-	m1
Default	Default 180.70.65.200	→	m2

Q:6(b) FORWARDING PROCESS IF A PACKET ARRIVES AT R_1 WITH DESTINATION 201.4.22.35

Scanned with CamScanner

00010011
11110000
0001|0000

01001000
11000000
01|000000

10000000
11010011
1|0000000

1) Network address
15.5.6.16
Broadcast address
15.5.6.31

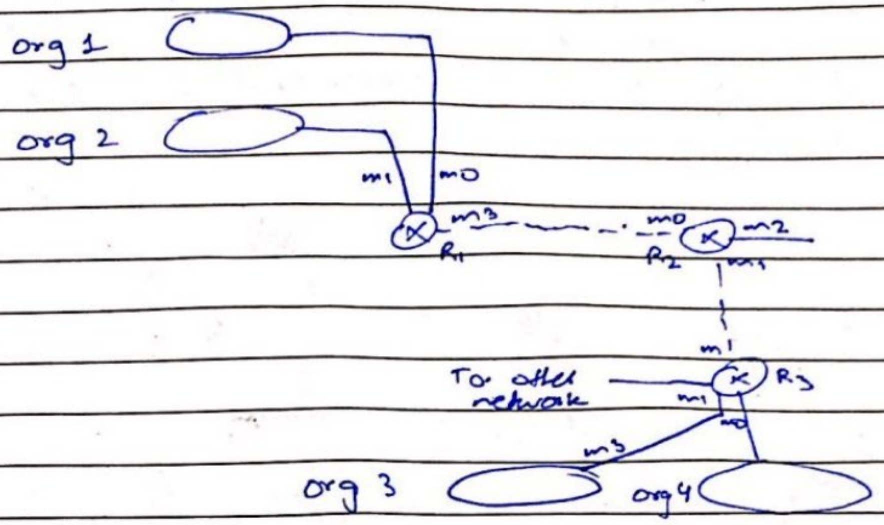
2)
Network address
212.172.38.64
Broadcast address
212.172.38.127

3) Network address
108.163.128.0
Broadcast address
108.163.255.255

Scanned with CamScanner

Date:

Question 6



Mask Network Address Next hop Interface

ROUTING TABLE FOR R_1

MASK	NETWORK AD	NEXT HOP	INTERFACE
/26	140.24.7.0	—	m0
/26	140.24.7.64	—	m1
~~DEFAULT~~	~~DEFAULT~~		
/0	0.0.0.0	ADDRESS OF R2	m3

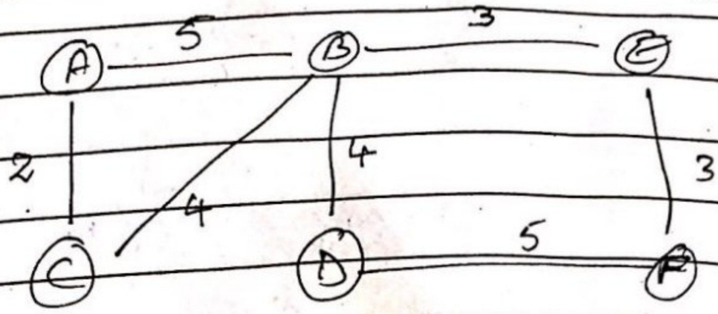
FOR R_2

MASK	NETWORK ADDRESS	NEXT HOP	Interface
/25	140.24.7.0	ADDRESS OF R_1	m0
/25	140.24.7.128	" " R_1	m1
/0	0.0.0.0	Default Router	m_2

Date:

R3

Mask	Network Address	Next Hop	Interface
/26	140.24.7.128	–	m3
/26	140.24.7.192	–	m0
/0	0.0.0.0	ADDRESS OF R_2	m2



c) ROUTING TABLE FOR NODE B

To	Cost	Next
A	5	–
B	0	–
C	4	–
D	4	–
E	3	–
F	∞	

To	Cost	Next
A	∞	
B	4	–
C	∞	
D	0	–
E	∞	
F	5	–

A	∞	
B	8	D
C	∞	D
D	4	D
E	∞	D
F	9	D

→ ~~Compare~~

A	5	–
B	0	–
C	4	–
D	4	–
E	3	–
F	9	D

Scanned with CamScanner

b) Create a routing table according to RIP algorithm.

RIP message from C

Net 2	4
Net 3	8
Net 6	4
Net 8	3
Net 9	5

RIP message from C after increament

Net 2	5
Net 3	9
Net 6	5
Net 8	4
Net 9	6

Old routing table

Net 1	7	A
Net 2	2	C
Net 6	8	F
Net 8	4	E
Net 9	4	F

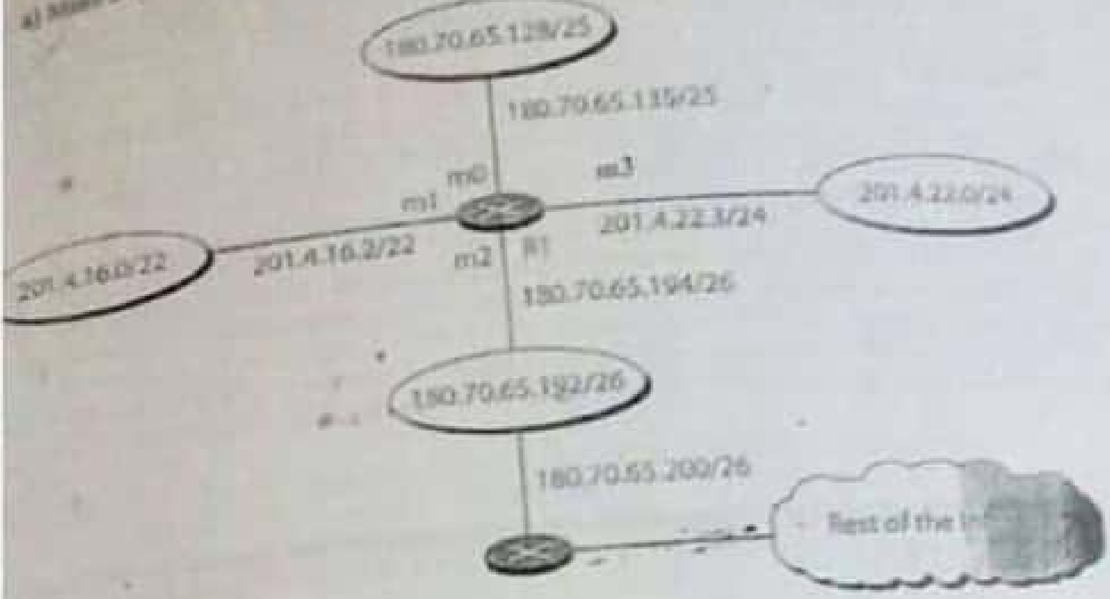
Updating Algorithm

T	C	N
Net 1	7	A
Net 2	2	C
Net 6	5	–
Net 8	4	–
Net 9	4	F
Net 3	9	–

New table

Question 6)

a) Make a routing table for Router R1 using the configuration given in the figure. (3)



<u>**Complete Routing table for router R1**</u>

Mask	Network Address	Next Hop	Interface

b) Show the forwarding process if a packet arrives at R1 in the above Figure with the destination address 201.4.22.35. (3)

c) For the following, determine the network address & the broadcast address. (3)

i.	15.5.6.19	255.255.255.240
ii.	212.172.38.72	255.255.255.192
iii.	108.163.211.115	255.255.128.0

m0)

PART A)

MASK	NETWORK ADDRESS	NEXT HOP	INTERFACE
/26	180.70.65.192	—	m2
/25	180.70.65.128	—	m0
/24	201.4.22.0	—	m3
/22	201.4.16.0	—	m1
Default	Default	180.70.65.200	m2

PART B)

*) packet with destination address 201.4.22.35

i) Apply mask /26
The result is:
201.4.22.0 / 26
Does not match

(ii) Apply mask /25
The result is:
201.4.22.0 / 25

Does not match

(iii) APPLY MASK /24
The result is:

201.4.22.0 /24
This matches with table row 3.
The next-hop & interface are extracted and sent to ARP for further processing.

Question 4) (06)

a) What do mean when we say that a switch can filter traffic? Why is filtering important? How does a router differ from a switch? (3)

b) Discuss the relationship between delay length, data unit size, and real time audio and video transmission. (3)

Question 5) (06)

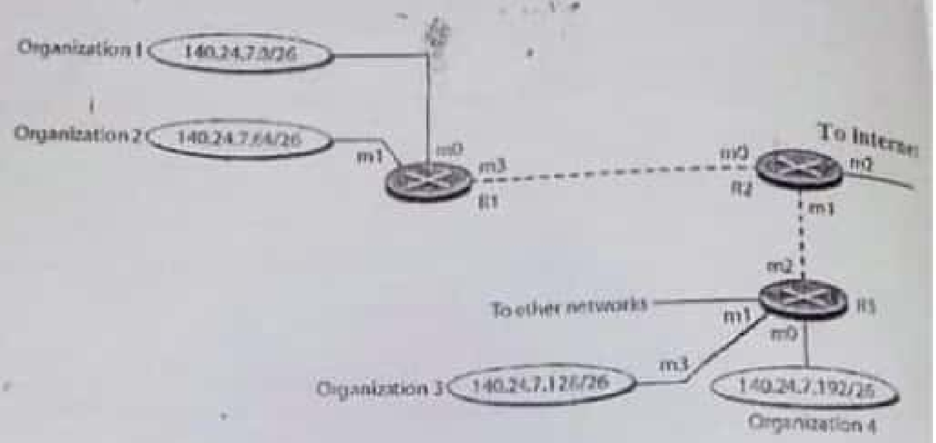
a) Describe how TCP establishes a connection between two end points? (2)

b) What is the difference between flow control and congestion control? (2)

c) What is the purpose of Delayed ACK timer in TCP? (2)

Question 6) (10)

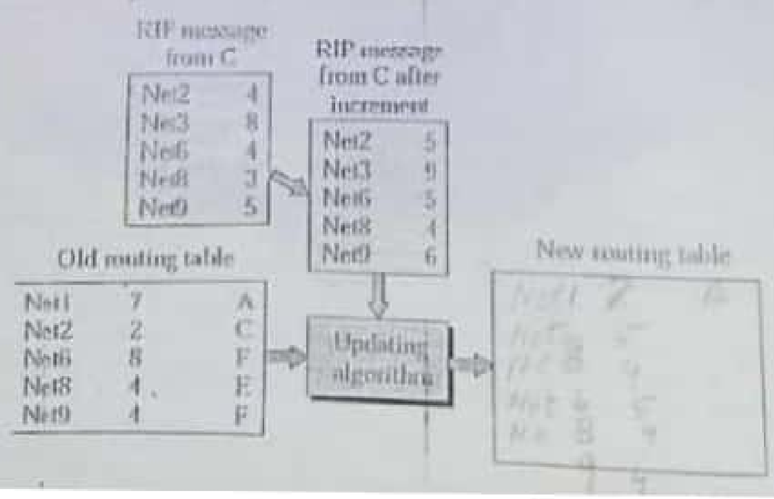
a) Make a routing table for Router R1, R2 & R3 using the configuration given in the figure.



Routing table Columns

Mask	Network Address	Next Hop	Interface

b) Create new Routing table according to RIP algorithm. (5)



Fullscreen
Search

Q2)

ROUTING TABLE (R_1)

MASK	NETWORK ADDRESS	NEXT HOP	INTERFACE
/26	140.24.7.0	—	m_0
/26	140.24.7.64	—	m_1
/0	0.0.0.0	ADDRESS OF R_2	m_3

AGGREGATION: $\underbrace{140.24.7.}$00000000, $\underbrace{..7.}$01000000

140.24.7.0 /25

ROUTING TABLE (R_3)

MASK	NETWORK ADDRESS	NEXT HOP	INTERFACE
/26	140.24.7.128	—	m_3
/26	140.24.7.192	—	m_0
/0	0.0.0.0	ADDRESS OF R_2	m_2

AGGREGATION

$\underbrace{140.24.7.}$10000000, $\underbrace{140.24.7.}$11000000

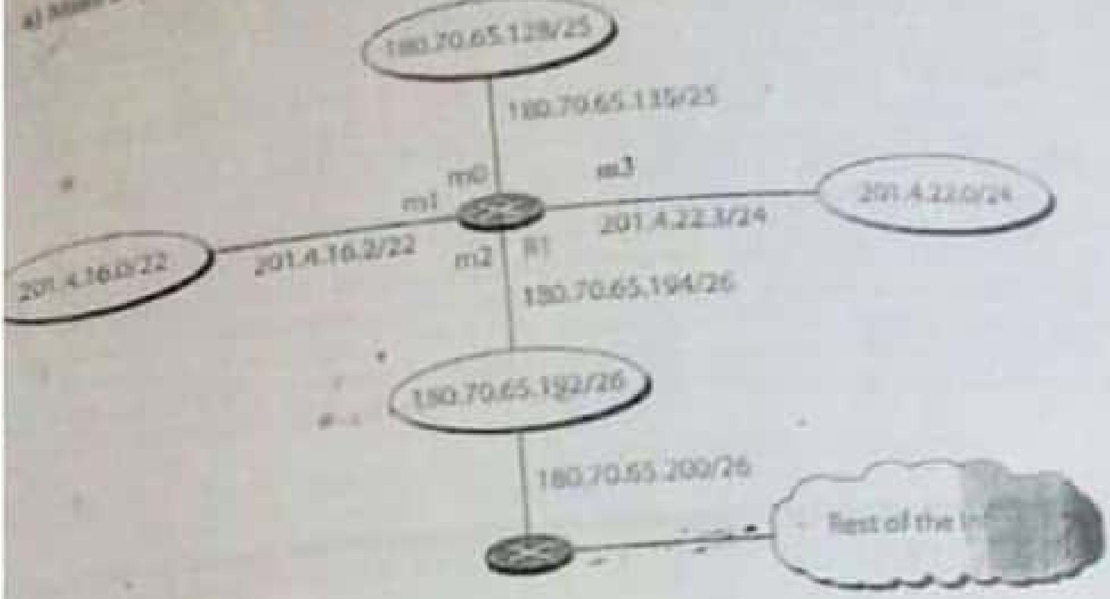
140.24.7.128 /25

ROUTING TABLE (R_2)

MASK	NETWORK ADDRESS	NEXT HOP	INTERFACE
/25	140.24.7.0	—	m_0
/25	140.24.7.128	—	m_1
/0	0.0.0.0	DEFAULT ROUTER	m_2

Question 6)

a) Make a routing table for Router R1 using the configuration given in the figure. (3)



Complete Routing table for router R1

Mask	Network Address	Next Hop	Interface

b) Show the forwarding process if a packet arrives at R1 in the above Figure with the destination address 201.4.22.35. (3)

c) For the following, determine the network address & the broadcast address. (3)

i.	15.5.6.19	255.255.255.240
ii.	212.172.38.72	255.255.255.192
iii.	108.163.211.115	255.255.128.0

Q2)

ROUTING TABLE (R_1)

MASK	NETWORK ADDRESS	NEXT HOP	INTERFACE
/26	140.24.7.0	—	m_0
/26	140.24.7.64	—	m_1
/0	0.0.0.0	ADDRESS OF R_2	m_3

AGGREGATION : $\underbrace{140.24.7.}$00000000 , $\underbrace{...7.}$01000000

140.24.7.0 /25

ROUTING TABLE (R_3)

MASK	NETWORK ADDRESS	NEXT HOP	INTERFACE
/26	140.24.7.128	—	m_3
/26	140.24.7.192	—	m_0
/0	0.0.0.0	ADDRESS OF R_2	m_2

AGGREGATION

$\underbrace{140.24.7.1}$0000000 , $\underbrace{140.24.7.1}$1000000

140.24.7.128 /25

ROUTING TABLE (R_2)

MASK	NETWORK ADDRESS	NEXT HOP	INTERFACE
/25	140.24.7.0	—	m_0
/25	140.24.7.128	—	m_1
/0	0.0.0.0	DEFAULT ROUTER	m_2

}
}

GO - BACK N

m = No. of frames to send

$S_{SIZE} = 2^{m} - 1$ = Sliding window length

S_n = Next frame to send

S_f = first outstanding frame

$R_{SIZE} = 1$

SELECTIVE REPEAT:

$S_{SIZE} = 2^{m-1}$, $R_{SIZE} = 2^{m-1}$

(rest is same)

15. Answer the following questions related to the Selective-Repeat protocol with $m = 7$ bits. Assume the window size is 64. (6)

a. The sending machine is in the ready state with $S_f = 10$ and $S_n = 15$. What is the sequence number of the next packet to send?

b. The sending machine is in the ready state with $S_f = 10$ and $S_n = 15$. The timer for packet 10 times out. How many packets are to be resent? What are their sequence numbers?

c. The sending machine is in the ready state with $S_f = 10$ and $S_n = 15$. An ACK with ackNo = 13 arrives. What are the next values of S_f and S_n? What is the action in response to this event?

d. The sending machine is in the blocking state with $S_f = 14$ and $S_n = 21$. What is the size of the window?

e. The sending machine is in the blocking state with $S_f = 14$ and $S_n = 21$. An ACK with ackNo = 14 arrives. Packets 15 and 16 have already been acknowledged. What are the next values of S_f and S_n? What is the state of the sending machine?

f. The receiving machine is in the ready state with $R_n = 16$. The size of the window is 8. A packet with sequence number 16 arrives. What is the next value of R_n? What is the response of the machine to this event?

Q: 15

a) ~~Sn = 15~~ Seq. number = 15
one frame to be resent

b) ~~11, 12, 13, 14~~ $S_n = 10$

c) ~~$S_f = 13$, $S_n = 14$~~ $S_f = 13$, $S_n = 15$

d) $S_f = 14$, $S_N = 21$

14 to 20 = Unack. frames (7)
window size = 64 − 7
= $\boxed{57}$

e) $S_F = 17$, $S_N = 21$, State: Blocked

f) $R_N = 17$, Send Ack No 17
(Frame 16 delivered)

d. The sending machine is in the blocking state with $S_f = 14$ and $S_n = 21$. What is the size of the window?

SF= 14 means 0 to 13 ack had been arrived. SN =21 (it means we had sent 20 frames and next frame is 21).

So 14,15,..... ,20 (7 frames are still not acknowledge)

Window size = 64 and 7 already sent so 64-7 =57

ANSWER = 57 **(means now we send upto 57 frames)**

f) The receiving machine is in the ready state with R_n = 16. The size of the window is 8. A packet with sequence number 16 arrives. What is the next value of R_n? What is the response of the machine to this event?

16	17	18	19	20	21	22	23

RN

Now packet 16 arrived. When ever packet comes Rn =Rn+1.

16	17	18	19	20	21	22	23

RN

ANSWER: RN=17,

Response of machine: Discard the packet and send the ackNo = RN

11101) 1010010111100000

11101
10011
11101
11100
11101
00011
00000
00111
00000
01111
00000
11110
11101
00110
00000
01100
00000
11000
11101
01010
00000
1010

1110 1010

11100010010

11101) 101001011101010

11101

10011

11101

11100

11101

00011

00000

00111

00000

01111

00000

11110

11101

00111

00000

01110

00000

11101

11101

00000

00000

0000

Here frame

... and in the network? What are their sequence numbers?

5. The sending machine is in the ready state with $S_f = 13$ and $S_n = 18$. An ACK with ackNo = 13 arrives. What are the next values of S_f and S_n? What is the action in response to this event?

6. The sending machine is in the blocking state with $S_f = 14$ and $S_n = 21$. What is the size of the window?

8. The sending machine is in the blocking state with $S_f = 14$ and $S_n = 21$. An ACK with ackNo = 14 arrives. Packets 15 and 16 have already been acknowledged. What are the next values of S_f and S_n? What is the state of the sending machine?

7. The receiving machine is in the ready state with $R_n = 16$. The size of the window is 5. A packet with sequence number 16 arrives. What is the next value of R_n? What is the response of the machine to this event?

11. Given a 10 bit sequence 10100101110 & a divisor 11101, find the CRC. (4)

10100101110

$= 2+4+8+32+256+1024$

$= 1346$

11101 $= 1+4+8+16$

$= 29$

CRC = 10101

2	21	
2	10	1
2	5	0
2	2	1
	1	0

12. Test the code word 11110001100 are correct, assuming they were created using an even parity Hamming Code. If it is incorrect, indicate what the correct code word should have been. Also, indicate what the original data was (4)

$r = ?$

101

0000000
0000001
0000010
0000011
0000100
0000101
0000110
0000111
0001000
0001001
0001010
0001011
0001100
0001101
0001110

0001111
0010000
0010001
0010010
0010011
0010100
0010101
0010110
0010111
0011000
0011001
0011010
0011011
0011100
0011101
0011110

0111111
1000000
1000001
1000010
1000011
1000100
1000101
1000110
1000111
1001000
1001001
1001010
1001011
1001100
1001101
1001110
1001111

1010000
1010001
1010010
1010011
1010100
1010101
1010110
1010111
1011000
1011001
1011010
1011011
1011100
1011101
1011110
1011111

1100000
1100001
1100010
1100011
1100100
1100101
1100110
1100111
1101000
1101001
1101010
1101011
1101100
1101101
1101110
1101111
1110000

r_4 r_3 r_2 r_1
1 1 1 1 1 0 0 0 1 1 0 0

Data without r bits: 11110001

12	11	10	9	8	7	6	5	4	3	2	1
1	1	1	1	1	0	0	0	1	1	0	0

r_1 = 1, 3, 5, 7, 9, 11, 13
r_2 = 2, 3, 6, 7, 10, 11, 14, 15
r_3 = 4, 5, 6, 7, 12, 13, 14, 15
r_4 = 8, 9, 10, 11, 12, 13, 14, 15

By THIS

For R_1

1 1 1 1 1 0 0 0 1 1 0 0

For R_2

1 1 1 1 1 0 0 0 1 1 0 0

For R_3

1 1 1 1 1 0 0 0 1 1 0 0

For R_4

1 1 1 1 1 0 0 0 1 1 0 0

Now,

r_4	r_3	r_2	r_1
1	0	1	1

$\Rightarrow$ 11^{th} bit

Now, the correct code word will be

$\boxed{101110001100}$

And the original data sent was:

$\boxed{10110001}$

Ans

Net8	4	F
Net9	4	F

algorithm

[illegible]

Question 1) (08)

a) In an IP Header, a packet has arrived with an M bit value of 0 and a fragmentation offset value of 0. Is this the first fragment, the last fragment, or a middle fragment? (1)

b) In an IP Header, a packet has arrived in which the offset value is 100, the value of HLEN is 5, and the value of the total length field is 100. What are the numbers of the first byte and the last byte? (1)

c) Draw the IPV4 header? (4)

d) What is NAT? How can NAT help in address depletion? (2)

BCS

Question 2) (08)

a) Aggregate the following set of IP network addresses to the highest degree possible (2)

212.56.132.0/24
212.56.133.0/24
212.56.134.0/24
212.56.135.0/24
212.56.136.0/24
212.56.137.0/24
212.56.138.0/24

b) Question lists problems that require you to analyze an existing IP address and mask to determine the number of network, subnet, and host bits. From that, you should calculate the number of subnets possible when using the listed mask in the class of network shown in the question, as well as the number of possible host addresses in each subnet. (6)

IP Address & Mask	Network Bits	Subnet Bits	Host Bits	Number of Subnets in Network	Number of Hosts per Subnet
10.66.5.99, 255.255.254.0					
192.168.55.55, 255.255.255.224					
172.30.40.166/26					

Question 3) (5)

Fill the right side with the appropriate layer of the OSI Model, hub, switch, router device.

Description	Device or OSI Layer
a. This device sends and receives information about the Network layer.	Route
b. This layer uses service access points.	
c. This device uses hardware addresses to filter a network.	
d. This layer supports flow control and sequencing.	
e. This device can measure the distance to a remote network.	
f. Logical addressing is used at this layer.	
g. This device creates one big collision domain and one large broadcast domain.	
h. This device creates many smaller collision domains, but the network is still one large broadcast domain.	
i. This device can never run full duplex.	

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* Aggregate the following IP addresses.

212.56.132.0 / 24
212.56.133.0 / 24
212.56.134.0 / 24
212.56.135.0 / 24
212.56.136.0 / 24
212.56.137.0 / 24
212.56.138.0 / 24

Sol

~~212.56.132~~
212.56.10000100.0 /24
212.56.10000101.0 / 24
212.56.10000110.0 / 24
212.56.10000111.0 / 24
212.56.10001000.0 / 24
212.56.10001001.0 / 24
212.56.10001010.0 / 24

$\boxed{212.56.128.0\ /20}$

27. Specify the eight subnets of 140.25.0.0/16.

i. Specify the 16 subnets of Subnet #6

ii. List the host address that can be assigned to subnet #6-3

iii. Identify the broadcast address for subnet #6-3

iv. Specify the eight subnets of subnet #6-14

~~we borrow 5 bits~~

⑧ specify 8 subnets of 140.25.0.0/16

Sol:

we borrow 3 bits $\Rightarrow 2^3 = 8$

140. $\boxed{25.000}$00000.0 /16 + 3

① 140.25.0.0/19
② 140.25.32.0/19
③ 140.25.64.0/19
④ 140.25.96.0/19
⑤ 140.25.128.0/19
⑥ 140.25.160.0/19
⑦ 140.25.192.0/19
⑧ 140.25.224.0/19

⑨ specify the 16 subnets of subnet #6.

Subnet #6 : 140.25.101$\boxed{0000}$0.0/19 +

borrow 4 bits.

① 140.25.160.0 /23
② 140.25.162.0 /23
③ 140.25.164.0 /23
④ 140.25.166.0 /23
⑤ 140.25.168.0 /23
⑥ 140.25.170.0 /23

⋮

⑭ 140.25.186.0 /23
⑮ 140.25.188.0 /23
⑯ 140.25.190.0 /23

⑧ List the host address that can be assigned to subnet # 6.3

subnet # 6.3 : 140.25.164.0 /23

① 140.25.164.1 /23
② 140.25.164.2 /23
③ 140.25.164.3 /23
④ 140.25.164.4 /23

⋮

(510) 140.25.165.254 /23

① identify the broadcast address for subnet # 6.3

① Subnet # 6.3 : 140.25.164.0/23

① Broadcast Address = 140.25.165.255 /23

① specify the eight subnets of subnet# 6.14

Subnet # 6.14 : 140.25.186.0 /23

140.25. 1011101$\boxed{0 . 00}$000000 /23
+3

① 140.25. 186 . 0 / 26
② 140.25. 186. 64 /26
③ 140.25.186. 128 /26
④ 140.25.186. 192 / 26
⑤ 140.25.187. 0 / 26
⑥ 140.25.187. 64 / 26
⑦ 160.25.187.128 /26
⑧ 160.25.187. 192 / 26