BITS, Pilani-Dubai Campus, Knowledge Village,Dubai

IIIrd Year Second Semester 2004-2005

Degree:B.E.(Hons) Branch:C.S.E

COURSE NO. : CS UC 461

COURSE TITLE : Computer Networks

Time :3 hrs Date :29-5-2005 Marks: 70

Comprehensive exam(closed book)

For all mathematical problems steps should be provided

Part-A

*Answer all the questions (All questions carry equal marks) (10 *2=20 M)*

Q1.Outline briefly the three factors that hold the internet together?
Q2.What is the difference in end point control of telephone networks compared to internet?
Q3.Outline any three activities carried out in network layer of internet protocol?
Q4.Using appropriate diagram outline how message is delivered in the form of a packet from application1 in source computer to another application2 in a destination computer via the internet protocol stack.
Q5.How a wireless lan differs from a wired lan in sharing a common medium ?
Q6.Briefly outline the protocol DHCP ?
Q7.What is the difference between TCP/IP and UDP/IP ? Give relevant usage of the above protocols.
Q8a).An AAL1 layer receives data at the rate of 3 Mps. How many cells are created per/sec by the ATM layer.
b)What is the total efficiency of ATM using AAL1(ratio of received bits to sent bits) ?
Q9.Outline how packet switching takes place in third generation switches ?
Q10.what is the difference in switching of cell switching networks and datagram packet switching networks.

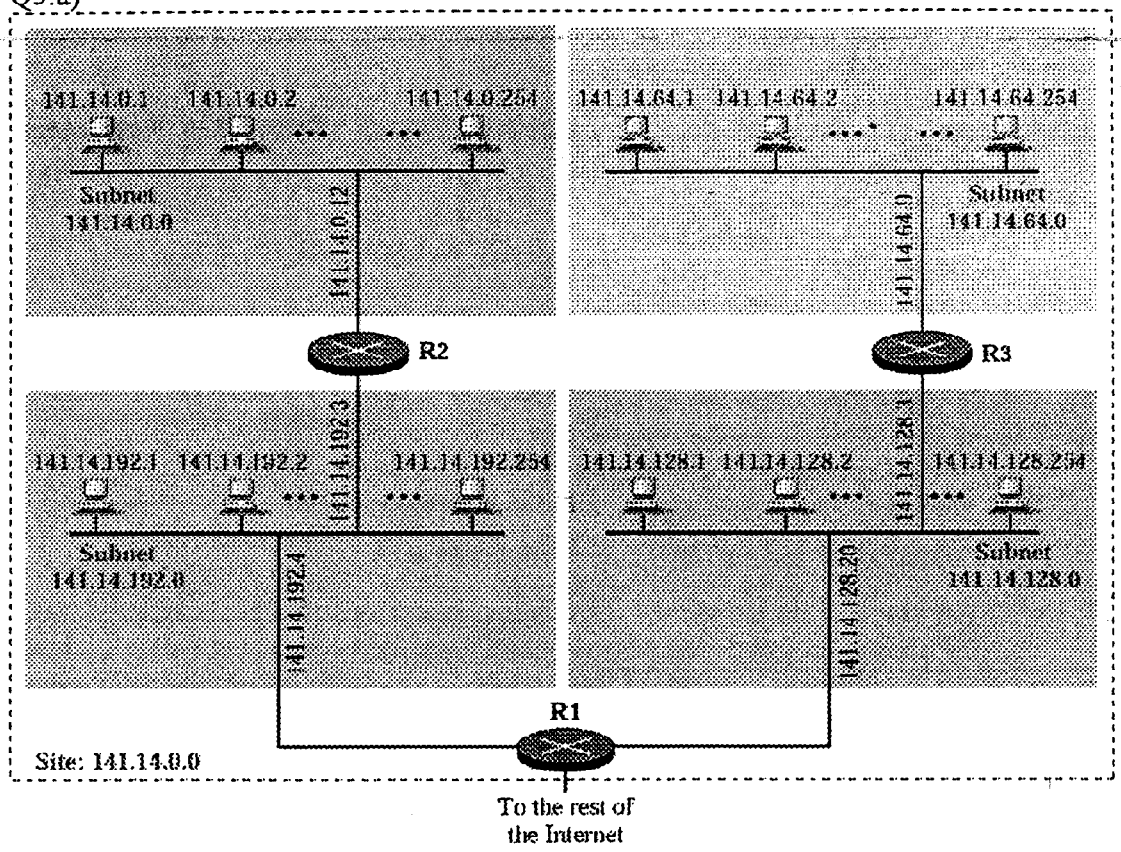
Part-B

*Answer all the questions (All questions carry equal marks) (5 *10=50 M)*

Q1 a)What is meant by Qos in packet switching network and briefly explain the parameters needed to measure the same.(3 M)
b)Outline three techniques using which Qos can be improved in a packet switching network (7 M)

Q2 a)Outline the difference between a router and and a gateway ? (3 M)
b)What is the need for multi port bridges ?(2 M)
c)With relevant diagram explain the steps involved in deriving routing table for distance vector routing ? (5 M)

Q3.a)



Outline how a packet with IP address 141.14.0.2 gets routed from an external router R_{Ext} in the internet to the corresponding destination computer as given in the above diagram.R1 is the router internal to the organization. Make necessary assumptions.(5M)

b)Find the maximum number of subnets in the following cases ?(2M)
1.In class A using the following mask 255.255.192.0
2.In class B using the following mask 255.192.0.0
c)In Time slot interchange (TSI) how many voice channels can be handled with a memory chip whose read or write access time is 100 n.sec. (3 M)

Q4.With relevant examples how the engineering concepts of a) Randomization, b)softstate c)batch processing, and d)changing state explicitly are applied to computer networks.[2.5+2.5+2.5+2.5]

Q5.a)I want to connect 24 customers from an telephone exchange1 to another 24 customers in exchage2 using circuit switching .Using relevant diagram outline the necessary modules to achieve the same .(4 M)
b)With the help of a simple example explain the need for multi stage cross bar switches over simple cross bar switches in circuit switching.(3 M)
c)With relevant example outline the need for TST switching ?(3 M)

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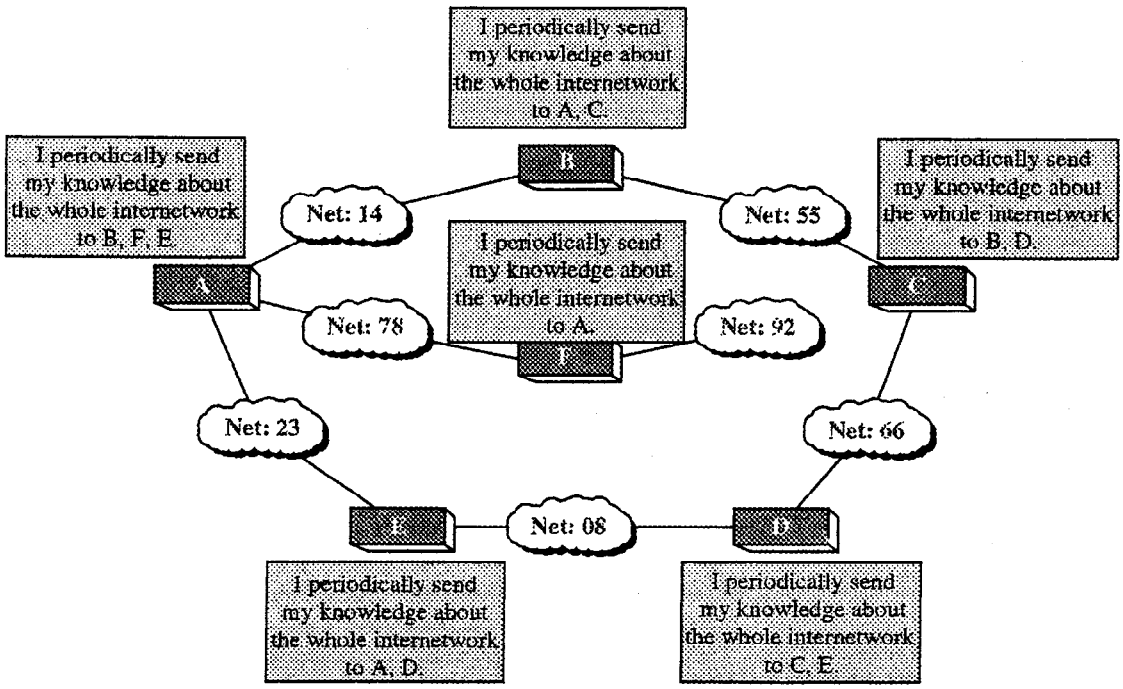
Answering and marking scheme

Part –B (All questions carry equal marks) (5 *10=50)

Q1.a)Parameters needed to measure QOS
Reliabilty,Delay,Jitter and Bandwidth- brief explanation is needed (3 M)
.b) Scheduling ,Traffic shaping and resource reservation are the means to improve the QOS –Each factor has to be explained (2+2+3)

Q2.Router operates upto network layer- Gateway operates at all the five layers of internet protocol –need for router and gateway have to be explained-3 M
b) need for multi port bridges-To interconnect multiple Lan segments-have to be explained with diagram -2 M

c)



Formation of intermediate routing table and final routing table have to be

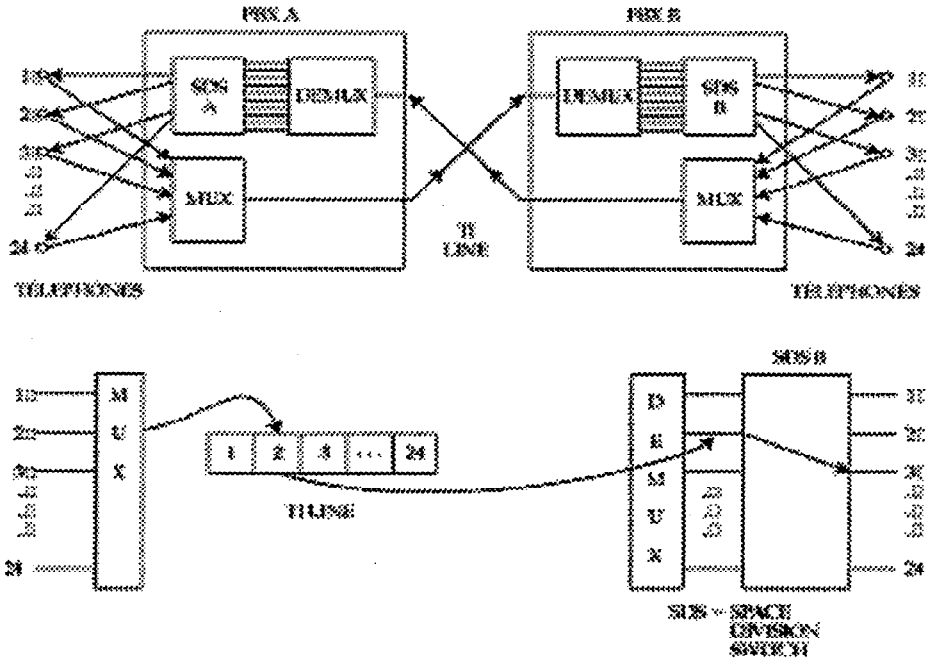
Q3.a)Routing of the packet by the external router to the internal router using the network ID has to be explained
How the internal router finds the subnet address and forward the packet to subnet 141.14.0.0 have to be explained (5 M)
b)Max number of subnets (2 M)

c) No of voice channels (3M)

Q4.Randomization –CSMA/CD applied in bus topology to resolve contention among nodes that want to communicate simultaneously –have to be discussed

Soft state:Reservation of ATM switches done using soft state-Advantage of softstate has to be discussed
Batch processing of packets leads to improved throughput at the cost of increased response time –have to be discussed
Changing state explicitly- Can be used in transfer of packets without loss – have to be discussed [2.5+2.5+2.5+2.5]

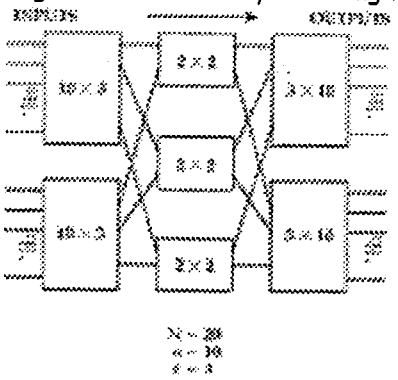
Q5.



a)Explanation for the above diagram has to be given-(4 M)

Multistage crossbar

- In a crossbar during each switching time only one cross point per row or column is active
- Can save crosspoints if a cross point can attach to more than one input line
- This is done in a multistage crossbar
- Need to rearrange connections every switching time

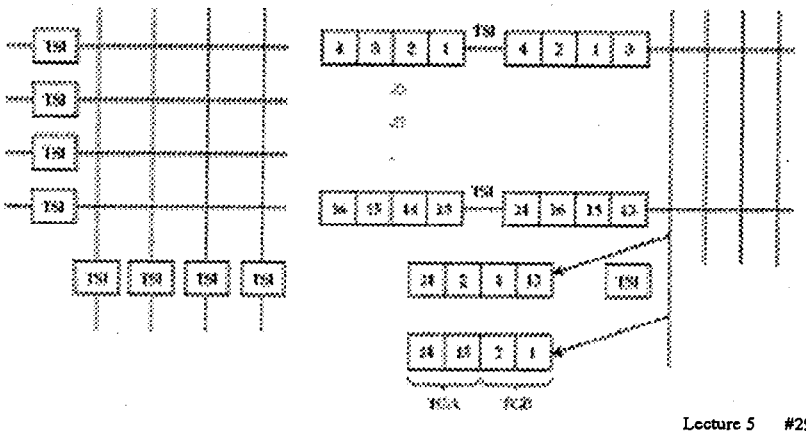


Lecture 5 #19

b) **(3 M)**

Time-space-time (TST) switching

- Allowed to flip samples both on input and output trunk
- Gives more flexibility => lowers call blocking probability



Lecture 5 #29

c) **(3 M)**

Part-A
(Answer all the questions) (10*2=20)

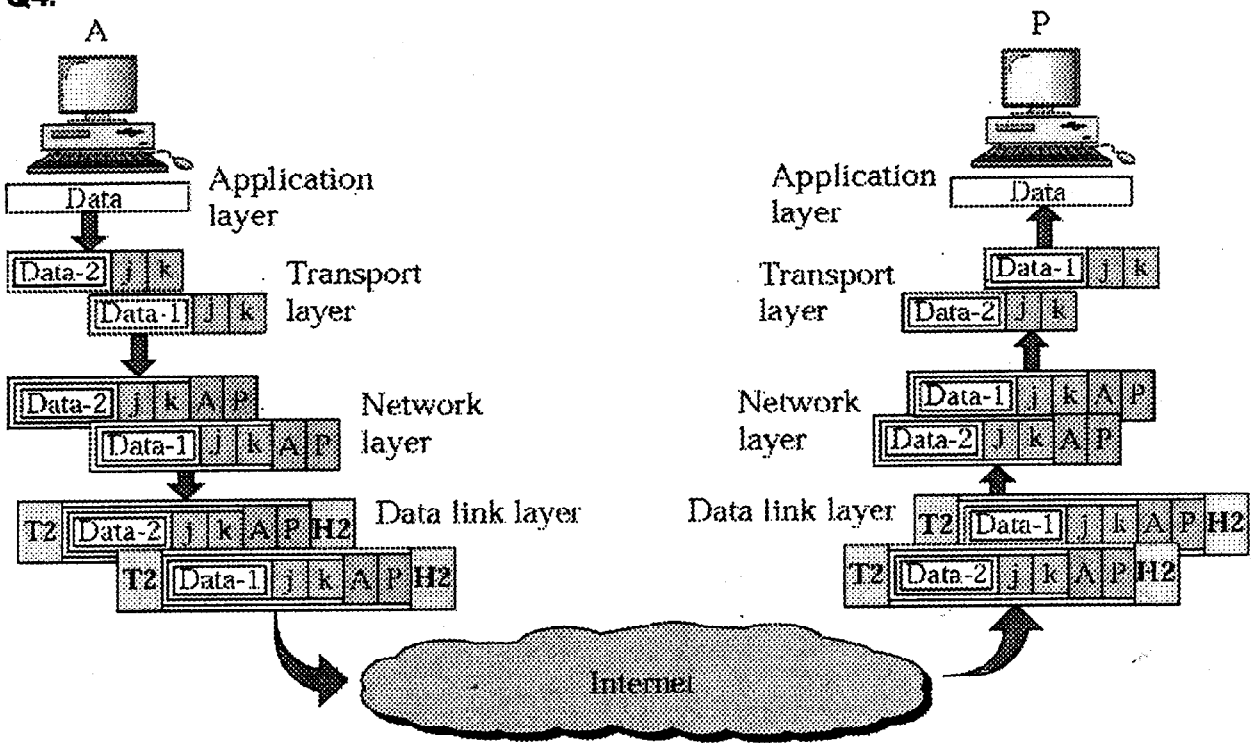
Q1. Addressing
how to refer to a machine on the Internet
Routing
how to get there
Internet Protocol (IP)
what to speak to be understood

The above factors have to be briefly explained

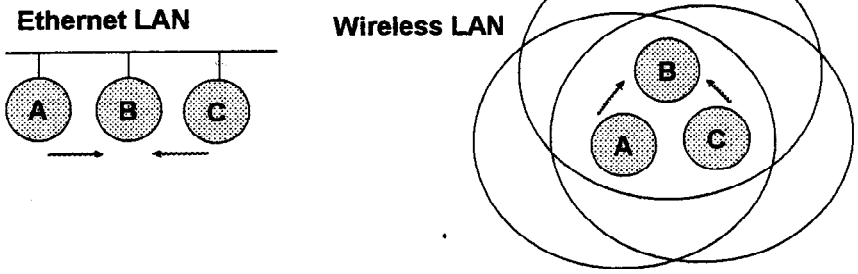
Q2.In telephone network end point control need not have intelligence – dumb-In internet end point systems have intelligence whereas the network is dumb-The above factors have to be explained

Q3. Routing decision can be based on a fixed / static routing policy or a dynamic (situation dependent) routing policy.
Other functions of the NL include congestion control, , protocol translation and resource usage accounting.

Q4.



Difference Between Wired and Wireless



- If both A and C sense the channel to be idle at the same time, they send at the same time.
- Collision can be detected at sender in Ethernet.
- Half-duplex radios in wireless cannot detect collision at sender.

Q5

Hidden Terminal Problem

- Hidden terminals
  - A and C cannot hear each other.
  - A sends to B, C cannot receive A.
  - C wants to send to B, C senses a "free" medium (CS fails)
  - Collision occurs at B.
  - A cannot receive the collision (CD fails).
  - A is "hidden" for C.
- Solution?
  - Hidden terminal is peculiar to wireless (not found in wired)
  - Need to sense carrier at receiver, not sender!
  - "virtual carrier sensing": Sender "asks" receiver whether it can hear something. If so, behave as if channel busy.

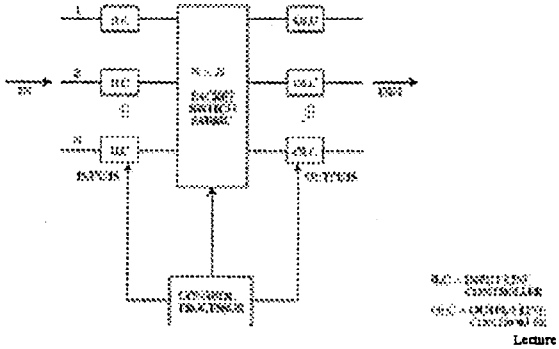
30

Q6.DHCP is used to assign IP addresses to various machines that are part of the network from a pool of IP addresses-have to be explained with diarams-different modes of operation in DHCP
Q7.In TCP/IP is a connection oriented protocol-ACK is sent for every packet(file transfer)-UDP/IP is a connection less protocol-(For MM packet transfer)
Q8) No of cells have to be computed using AAL1 layer

Also efficiency of ATM using AAL1 have to be computed

Third generation switches

- Bottleneck in second generation switch is the bus
- Third generation switch provides parallel paths (fabric)



Lecture 5 #40

Q9.

Q10 Cell switching.
Preplanned route established before packets sent

- **All packets follow same route**
- **Similar to circuit in circuit-switching network**
  - **Hence virtual circuit**
- **Each packet has virtual circuit identifier**
  - **Nodes on route know where to direct packets**

  - No routing decisions
- Datagram: each packet treated independently
  - No reference to packets that have gone before
  - Each node chooses next node on path
  - Packets with same destination address do not follow same route
  - May arrive out of sequence
  - Exit node or destination restores packets to original order
  - Packet may be destroyed in transit
  - Either exit node or destination detects loss and recovers
- Call setup avoided

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COURSE NO. : CS UC 461
COURSE TITLE : COMPUTER NETWORKS
Time :50 mts Date :15-5-2005 Marks: 50

Open book-Answer all the questions(answering scheme)

Q1.with relevant examples explain how response time is traded for throughput in case of batching the tasks in computer networks ?

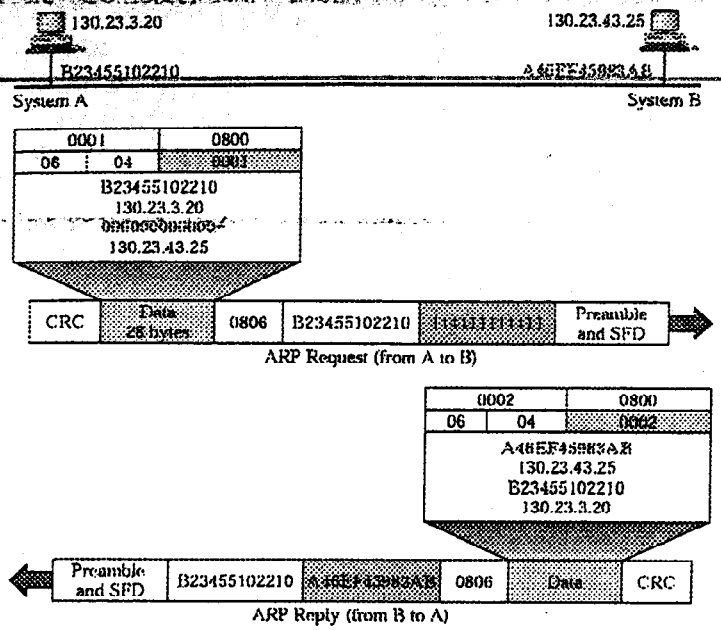
Using a set of pacet processing tasks bring out the overhead due to interrupt in servicing task one by one. Then explain how by batching the tasks we can execute them with minimum interrupt overhead. (3+3)?

Q2. Using diagrams explain how link state packet is formed-how link state database is created-how using Dijkstra algorithm appropriate graph is drawn and from that routing table is formed.(2+2+2)

Q3.**In the case of ring topology, a person who is having the token alone be able to send the packet, via the medium- Explanation about how this would lead to sharing a common medium have to be provided. Similarly in the case of bus topology how different** nodes share a common medium using CSMA/CD have to be explained(3 +3)

Q4. A host with IP address 130.24.4.20 and physical address AB3455102210 has a packet to send to another host with IP address 130.27.43.25 and physical address BBCEF45983AB. The two hosts are on the same Ethernet network. Show the ARP request and reply (3 +3)

Figure 20.6 Example 1



ARP request and response for the given problem should be similar to the above given in the diagram with the appropriate changes in the IP address and MAC address.

Q5. Outline how using Ethernet bridge in a Ethernet network we can improve the performance?(4 M)

In the case of Ethernet why the value of parameter " a " should be less than or equal to 1?(2M)

Appropriate explanation about how using the bridge, bus throughput can be improved because of simultaneous transmission between more than one pair of nodes.

In Ethernet frame before the transfer of packet is completed collision should be known. This is possible only if a < =1

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COURSE NO. : CS UC 461

Date:3-4-2005 **COURSE TITLE : Computer Networks**

Time :50 mts **Closed book** STEPS FOR NUMERIC COMPUTATION NEEDED

All questions carry equal marks: Answer all the questions

1 .Find the class of each address in a IP network:
a)227.12.14.87
b)252.5.15.111
c)134.11.78.56 (1.5M +1.5 M+ 1.5 M)

d) How many computers can be provided Class B addresses ? (1.5)

2. With relevant diagrams outline the differences in switching of circuit switching, packet switching and virtual circuit switching networks.(6 M)

3.a) An AAL1 layer receives data at 2 Mbps. How many cells are created per second by the ATM layer ? (3 M)
b)What is the total efficiency of ATM using AAL1(the ratio of received bits to sent bits) ? (3 M)

4.Using AAL5 show the situation where we need ---------- of padding.
a)0 bytes (no padding) (2 M)
b)40 bytes (2 M)
c)47 bytes (2 M)

5.Outline the clearly the need for multiplexing of digital voice packets? (2M)
Briefly compare the two techniques using time division multiplexing and frequency division multiplexing of digital voice packets using relevant diagrams?(4)

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COURSE NO. : CS UC 461

Date:3-4-2005 **COURSE TITLE : Computer Networks**

Time :50 mts **Closed book** **Max Marks:30**

All questions carry equal marks: Answer all the questions
Steps for numeric computation should be given
Answering and marking scheme

1 .Find the class of each address in a IP network:
a)227.12.14.87 class D
b)252.5.15.111 class E
c)134.11.78.56 class B (1.5M +1.5 M+ 1.5 M)

d) How many computers can be provided Class B addresses? (1.5)

$2^{14} * 2^{16}$

2. With relevant diagrams outline the differences in switching of circuit switching, packet switching and virtual circuit switching networks.(6 M)
With the help of diagrams
1. Physical circuit establishment in circuit switching
- Connection established before data transmission begins
- Channel capacity must be available and reserved.
- Nodes must have capacity to handle connection
- Switches must have intelligence to make allocations and devise route
- Can be inefficient
  - Capacity dedicated for duration of connection
    - Even if no data are being transferred
  - For voice, utilization high, but still doesn't approach 100%
  - For terminal connection, may be idle most of the time
  - Delay prior to data transfer for call establishment
  - Once circuit established, network transparent to users
  - Data transmitted at fixed rate
    - No delay other than propagation
    - Delay at node negligible

2.Packet switching

- Data are transmitted in short blocks, called packets
- Typical upper bound 1000 octets (bytes)
- Longer messages broken up into series of packets
  - Each packet contains part (or all for short message) of user's data plus some control information
  - Control information includes network routing
  - At each node, packet is received, stored briefly, and passed on to the next node
- Transmitting computer sends message as sequence of packets
- Packet includes control information including destination station
- Packets sent to node to which sending station attaches
- Node stores packet briefly, determines next leg of route, and queues packet to go out on that link
- When link is available, packet is transmitted to next node
- All packets eventually work their way through network
- Datagram: each packet treated independently
  - No reference to packets that have gone before
  - Each node chooses next node on path
  - Packets with same destination address do not follow same route
  - May arrive out of sequence
  - Exit node or destination restores packets to original order
  - Packet may be destroyed in transit
  - Either exit node or destination detects loss and recovers
- Call setup avoided
- For an exchange of a few packets, datagram quicker
- More flexible.
  - E.g. Routing away from the congestion
  - Delivery is inherently more reliable
    - If a node fails, subsequent packets may be re-routed

3. Virtual circuit switching:
- Preplanned route established before packets sent
- All packets follow same route
- Similar to circuit in circuit-switching network
  - Hence virtual circuit
- Each packet has virtual circuit identifier
  - Nodes on route know where to direct packets
  - No routing decisions
- Not dedicated path, as in circuit switching
  - Packet still buffered at node and queued for output
  - Routing decision made oncefor that virtual circuit
- Network may provide services related to virtual circuit
  - Sequencing and error control
- Packets should transit more rapidly
- If node fails, all virtual circuits through node lost

3.a) An AAL1 layer receives data at 2 Mbps. How many cells are created per second by the ATM layer ? (3 M)

$2 * 10^6 / (47 * 8)$

b)What is the total efficiency of ATM using AAL1(the ratio of received bits to sent bits) ? (3 M)
47/53

4.Using AAL5 show the situation where we need ---------- of padding.
a)0 bytes (no padding) (2 M)
Message length=40bytes
b)40 bytes (2 M)
message length=48bytes
c)47 bytes (2 M)
message length= 41 bytes

5.Outline the clearly the need for multiplexing of digital voice packets? (2M)
Briefly compare the two techniques using time division multiplexing and frequency division multiplexing of digital voice packets using relevant diagrams?(4)

Trunks between central offices carry hundreds of conversations
Can't run thick bundles! Will lead to lot of overhead
Instead, send many calls on the same wire
That is called as multiplexing

Figure 6.6 *Example 1*

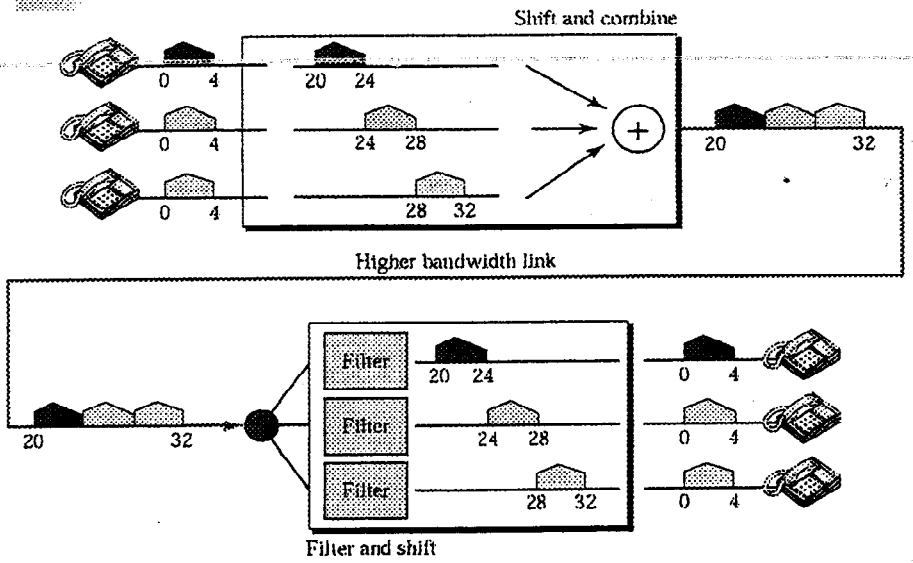

Figure 8.7 *Time-division multiplexing, without and with a time-slot interchange*