AUTUMN END SEMESTER EXAMINATION-2024
5th Semester B.Tech

COMPUTER NETWORKS

CS 30003 / IT 3009

(For 2023 (L.E), 2022 & Previous Admitted Batches)

Time: 2 Hours 30 Minutes

Full Marks: 50

Answer any FIVE questions.
Question paper consists of two SECTIONS i.e. A and B.
Section A is compulsory.
Attempt any Four question from Sections B.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable
and <u>all parts of a question should be answered at one place only</u>.

SECTION-A

1.   Answer the following questions.   [1 × 10]

(a)   Many business computers have three distinct and worldwide unique identifiers. What are they?

(b)   Consider a highway which has a toll booth every 100 KM. Suppose that cars travel on the highway at a rate of 100 km/hour. There are 10 cars in a caravan. Each toll booth services a car at a rate of one car per 12 seconds. How long until caravan is lined up before 2nd toll booth?

(c)   A system has an n-layer protocol hierarchy. Applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers?

(d)   Mention the difference between CSMA/CA and CSMA/CD.

(e)   How does stable end-to-end latency impacts the transport layer. Explain with the difference between flow control and congestion control.

(f)   State the importance of commercial cookies in websites.

(g)   In classless addressing, can two different blocks have the same prefix length? Explain.

(h) In a nonpersistent HTTP connection, how can HTTP inform the TCP protocol that the end of the message has been reached?

(i) An IPv4 packet has arrived with the first few hexadecimal digits as shown

$$(45000028000100000102\ldots)_{16}$$

How many hops can this packet travel before being dropped? Find the length of data in Bits?

(j) In a network using the Selective-Repeat protocol with m = 4 and the sending window of size 8, the value of variables are Sf = 62, Sn = 67, and Rn = 64. Packet 65 has already been acknowledged at the sender site; packets 65 and 66 are received out-of-order at the receiver site. Assume that the network does not duplicate the packets.

  (i) What are the sequence numbers of pending data packets (in transit, corrupted, or lost)?

  (ii) What are the acknowledgment numbers of pending ACK packets (in transit, corrupted, or lost)?

SECTION-B

2. (a) Sketch the header format of IPv4 datagram with detailed explanation of each field. And highlight the importance of fragmentation offset and TTL field. [5]

   (b) What is the difference between Segmentation and fragmentation? [5]

   An IP packet of size 1600 bytes passes through network segment before it reaches its destination. The header size of this packet is 30 bytes. The maximum size of an IP packet in intermediate network (MTU) is 1400 bytes. How the IP packet would be fragmented in a router? Find all the information for each fragment.

3. (a) What you mean by standard and Nonstandard protocols? Briefly describe few applications from each category. [5]

   Explain briefly the use of application Programming Interface (API). Assuming that an application program running on a host named abc.inet.com needs to find the

IP address of another host named science.mcgraw-hill.com to send a message. Show the different methods for the resolution method with figurative explanation.

(b) (i) What is the total size of the minimum TCP MTU, including TCP and IP overhead but not including data link layer overhead? [5]

(ii) The maximum payload of a TCP segment is 65,495 bytes. Is the statement being correct? Why were such a strange number chosen?

4. (a) Describe TCP Transmission Policy and Acknowledgement Policy. Explain TCP Timer Management by mentioning different types of timers and their use. [5]

(b) Explain Briefly TCP Congestion Control methods. [5]

Consider the effect of using slow start on a line with a 10-msec round-trip time and no congestion. The receive window is 24 KB and the maximum segment size is 2 KB. How long does it take before the first full window can be sent?

5. (a) Justify how Address aggregation proved to be advantageous for classless addressing with an example. [5]

Explain Network Address Translation (NAT) operation in detail.

(b) Suppose a router has built up the routing table shown in Routing Table. The router can deliver packets directly over interfaces 0 and 1, or it can forward packets to routers R2, R3, or R4. Assume the router does the longest prefix match. Describe what the router does with a packet addressed to each of the following destinations: [5]

(i) 128.96.171.92   (ii) 128.96.167.151
(iii) 128.96.163.151   (iv) 128.96.169.192
(v) 128.96.165.121

Routing Table		
Subnet Number	Subnet Mask	Next Hop
128.96.170.0	255.255.254.0	Interface 0
128.96.168.0	255.255.254.0	Interface 1
128.96.166.0	255.255.254.0	R2
128.96.164.0	255.255.252.0	R3
Default		R4

6. (a) An ISP is granted the block 80.70.56.0/21. The ISP needs [5]
to allocate addresses for two organizations each with 500
addresses, two organizations each with 250 addresses, and
three organizations each with 50 addresses.

- Find the number and range of addresses in the ISP
block.
- Find the range of addresses for each organization
and the range of un-allocated addresses.
- Show the outline of the address distribution and the
forwarding table.

(b) Use Dijkstra's algorithm to find the shortest path tree [5]
and the forwarding table for node A in the following
Figure.
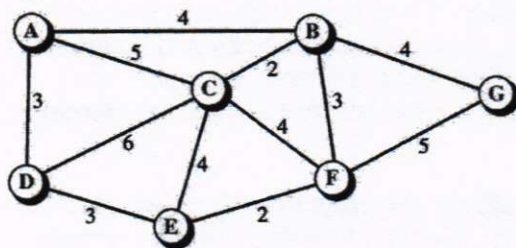
7. (a) What are the two sublayers of data link layer? Briefly [5]
describe each.

Draw Ethernet frame format with a suitable diagram.
Explain each fields along with their length and role.

(b) What do you mean by error detection and correction in [5]
link layer? Mention few methods from each.

How the error detection methods at transport layer
different from the link layer? Mention the common
error control methods used at transport layer and data
link layer.

Given the dataword 101001111 and the divisor 10111,
show the generation of the CRC codeword at the sender
site (using binary division).

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