Indian Institute of Information Technology, Sri City, Chittoor

Name of the Exam: Computer and Communication Networks (CCN)

Duration: 100 mins Max. Marks: 50 Marks

Instructions:

1. Closed book exam
2. Must turn on video and mic throughout the exam.
3. Please keep enough A4 sheets to write answers. Each A4 should have your Name, Roll number and page number on the top right corner.
4. Charge your laptops and mobiles ahead of exam to avoid issues during the exam. Suggested to keep alternate mobile phones in case of network issues
5. Total Exam session will be recorded.
6. Each student should start scanning the answer scripts in the order from 10:40 AM and should submit before 10:50 AM as a single pdf document through the shared google classroom link.
7. Assumptions made should be clearly stated
8. All sub-parts of the question should be written together

Section-I

1. Suppose there is a 33 Mbps microwave link between a geostationary satellite and its base station on Earth. Every minute the satellite takes a digital photo and sends it to the base station. Assume a propagation speed of 2.4 x 10^8 meters/sec. [2+1]
   a. What is the propagation delay of the link?
   b. What is the bandwidth-delay product, $R \cdot d_{prop}$?
2. Suppose two hosts, A and B, are separated by 20,000 kilometers and are connected by a direct link of R = 2 Mbps. Suppose the propagation speed over the link is 2.5 * 10 8 meters/sec. [2+1]
   a. Consider sending a file of 105,000 bits from Host A to Host B. Suppose the file is sent continuously as one large message. What is the maximum number of bits that will be in the link at any given time?
   b. Provide an interpretation of the bandwidth-delay product.
3. Coaxial cable consists of two insulated copper wires twisted together
   a. True
   b. False
4. cellular telephone system primarily uses guided media
   a. True
   b. False

Section-II

5. Assume that you have a base HTML file with 14 embedded images, images & base file are small enough to fit in one TCP segment. How many RTT are required to retrieve base file & images under-following condition :[2+2]
   a. Non-persistent connection with 5 parallel connection

b. Persistent connection with pipe-lining

6. In http, the server maintains information about past client requests
   a. True
   b. False

7. In non-persistent HTTP, server leaves connection open after sending response
   a. True
   b. False

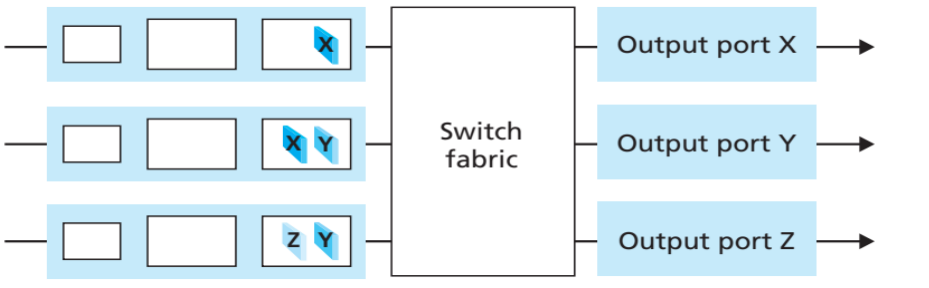
Section-III

1. Describe the rdt 1.0: reliable transfer over a reliable channel with finite state machines (FSM) diagram [3]
2. Suppose that the five measured SampleRTT values are 96 ms, 110 ms, 120 ms, 70 ms, and 105 ms. Compute the EstimatedRTT after each of these SampleRTT values is obtained, using a value of $\alpha = 0.115$ and assuming that the value of EstimatedRTT was 90 ms just before the first of these five samples were obtained. Compute also the DevRTT after each sample is obtained, assuming a value of $\beta = 0.20$ and assuming the value of DevRTT was 5 ms just before the first of these five samples was obtained. Last, compute the TCP TimeoutInterval after each of these samples is obtained. [4+3]

Section-IV

1.Explain briefly the Dual stack and Tunneling approaches in the context of IPV4 to IPV6 transition with a neat diagram ? [5M]

2.Consider the switch shown below. Suppose that all datagrams have the same fixed length, that the switch operates in a slotted, synchronous manner, and that in one time slot a datagram can be transferred from an input port to an output port. The switch fabric is a crossbar so that at most one datagram can be transferred to a given output port in a time slot, but different output ports can receive datagrams from different input ports in a single time slot. What is the minimal number of time slots needed to transfer the packets shown from input ports to their output ports, assuming any input queue scheduling order you want (i.e., it need not have HOL blocking)? What is the largest number of slots needed, assuming the worst-case scheduling order you can devise, assuming that a non-empty input queue is never idle? [3M]



3. Given the example table for the fragmentation, choose the set of values for the last fragment for a 1500-byte datagram into a link that has an MTU of 600 bytes including 40 bytes header. Suppose the original datagram is stamped with the identification number 222. [3M]

Fragment	Bytes	ID	Offset	Flag
1st fragment	1,480 bytes in the data field of the IP datagram	identification = 777	offset = 0 (meaning the data should be inserted beginning at byte 0)	flag = 1 (meaning there is more)

A) Fragment-3, Bytes- 240, identification-222, offset = 320, Flag=1
B) Fragment-4, Bytes- 140, identification-222, offset = 220, Flag=1
C) Fragment-3, Bytes- 340, identification-222, offset = 120, Flag=1
D) Fragment-3, Bytes- 540, identification-222, offset = 420, Flag=1

Section-V

1. Suppose four active nodes—nodes A, B, C and D—are competing for access to a channel using slotted ALOHA. Assume each node has an infinite number of packets to send. Each node attempts to transmit in each slot with probability p. The first slot is numbered slot 1, the second slot is numbered slot 2, and so on.
   i) What is the probability that node C succeeds in slot 4? [2M]
   ii) What is the probability that the first success occurs in slot 3? [2M]

2. Explain briefly CSMA Collision Detection (CD) and relevance of exponential back off mechanisms with a neat diagram ? [5M]
3. In CSMA/CD protocol, the adapter waits K*512 bit times after a collision, where K is drawn randomly. For K = 80, how long does the adapter wait until returning to Step 2 for a 1 Mbps broadcast channel [2M]
   A)100 milliseconds
   B) 4.96 milliseconds
   C) 0.4096 milliseconds
   D)40.96 milliseconds

4. A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1. Show the actual bit string transmitted. Suppose the third bit from the left is inverted during transmission. Show that this error is detected at the receiver's end.
   [4M]

---------- All the best ----------