Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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A Constituent Institute of Manipal Academy of Higher Education

IV SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: TCP/IP PROTOCOL SUITE [ICT 2254]

REVISED CREDIT SYSTEM
(27/04/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data, if any, may be suitably assumed.

1A. In the topology of Fig. Q.1A, assume all the links are bidirectional and the cost is the same for both directions. Use the Bellman Ford algorithm to find the lowest cost paths to R1 for all the nodes. For each step before convergence, show the current lowest cost to reach R1 and the next hop router to get there for each node. 5

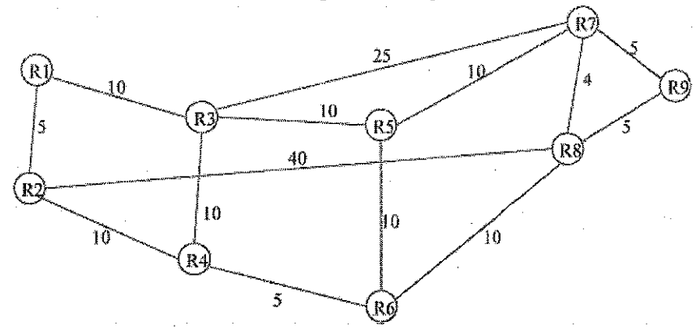

Fig. Q.1A

1B. Consider a packet with a total length of 250 bytes (including IPv4 header, with no options) and an id field equal to 17, sent from a host *A* to a host *B*, passing through routers *X* and *Y*. Assume that the subnet where host *A* is connected has an MTU of 500 bytes, the subnet where host *B* is connected has an MTU of 80 bytes and the subnet between *X* and *Y* has an MTU of 120 bytes. 3

i) Assuming that the "don't fragment" flag is not set, how many fragments does router *X* divide the packet into? What is the length of each fragment?
ii) Compute the values of id, MF, DF, Total Length and offset in the fragments forwarded at Router Y.
iii) Suppose host A sends a 50 byte packet with the "don't fragment" flag set. Explain what happens to this packet at each of the two routers.

1C. How do bridges learn addresses in an Ethernet network? 2

2A. Why are protocols layered? Explain protocol stack. Identify the key functionalities of the different layers of TCP/IP protocol suite along with the protocols in each layer. 5

2B. List the steps involved in forward mapping using DNS? Using suitable examples describe the domain namespace used in the Internet. 3

2C. In a wireless network, the use of RTS/CTS helps combat which problem and how? 2

3A. An application at 198.75.24.121, port 4052 wants to send a UDP datagram containing "elvis0" to 198.75.24.36, port 5134. Calculate the checksum. 5

3B. For network id 99.0.0.0/8, answer the following questions: 3

i) To which class does the starting address belong to?
ii) Is the address private or public?
iii) Calculate the new mask required to provide 510 usable hosts per subnet.
iv) What is the number of subnets created?
v) What is the new mask in CIDR notation?
vi) What is the new mask in dotted decimal notation?

3C. Explain the difference between traffic shaping and traffic policing. 2

4A. Host A and B are communicating over a TCP connection, and Host B has already received from Host A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A. 5

i) In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number?
ii) If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?
iii) If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?
iv) Suppose the two segments sent by A arrive in order at B. The first acknowledgment is lost and the second acknowledgment arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgments sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgment that you add, provide the acknowledgment number.

4B. When routers generate ICMP messages, to where do they send them? Along with the ICMP header at the beginning, what additional contextual information do routers include in the messages? 3

4C. What is DHCP? Which protocol and ports are used by DHCP server and client? 2

5A. Host A sends a file consisting of 9 MSS-sized segments to a host B using TCP. Assume that the 4th segment in the transmission is lost. Assume the retransmission timeout is T, the one-way latency is d, and that T > 4*d. Ignore the transmission time of the segments and of the acknowledgements. Also, assume the TCP three-way handshake has completed, but no data has been transmitted. 5

a. Assume no fast retransmission or fast recovery. Draw the time diagram showing each segment and acknowledgement until the entire file is transferred. Indicate on the diagram all changes in the cwnd and ssthresh. How long does it take to transfer the file?
b. Answer part (a) assuming TCP Reno, i.e., the TCP version that implements both fast retransmission and fast recovery.

Note:

- For Fast Recovery, assume that each duplicate acknowledgment increases cwnd by 1.
- For Fast Recovery, assume that, upon receiving a non-duplicate acknowledgment, cwnd drops back to ssthresh.
- If the value of cwnd is fractional, you should round it to the closest larger integer.
- The transfer time is the time interval measure at source A from the time the first segment is sent until the acknowledgement of the last segment is received

5B. The diagram in Fig. Q.5B shows a WIFI network with an access point, X and three hosts, A, B and C. The large circles indicate the coverage areas of the three hosts. The coverage area for X is not shown, but you may assume that it includes all three hosts. Assume RTS/CTS are not used. Suppose X is transmitting a packet at time 0 and finishes sending it at time 100 μs. Also, 3

- A gets a packet to send at time 50 that takes 100 μs to send and is assigned a back-off timer of 100.
- B gets a packet at time 70 that takes 200 μs and is assigned a back-off timer of 50.
- C gets a packet at time 90 that takes 150 μs and is assigned a back-off timer of 150.

For each of the three hosts, what time do they start sending their packets? You may ignore the inter-frame spacing and the time required for acknowledgements.

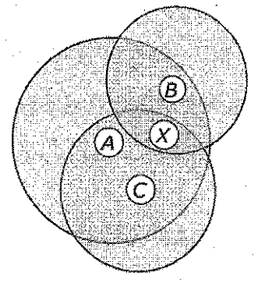

Fig. Q.5B

5C. Ethernet protocol uses CSMA/CD for multiple access control. When a collision is detected, how does Ethernet back-off to avoid future collisions? What is the advantage of this scheme compared to random back-off? 2