Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FIRST SEMESTER MTECH. (DECE) DEGREE END SEMESTER EXAMINATION
AUGUST 2021
SUBJECT: COMMUNICATION NETWORKS AND PROTOCOLS (ECE - 5151)

TIME: 2 HOURS **MAX. MARKS: 40**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Draw the ISO: OSI Reference model and mention the functions of each layer.

1B. We are given a medium that will reliably transmit frequencies between 0 and 25,000Hz. Is it possible to transmit 200Kbps of information along this line? If so, then describe a method and any conditions that must be satisfied. If not, explain why.

(5 + 5)

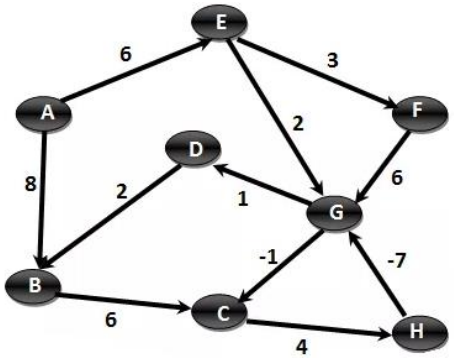
2A. If there is a 128 Mbps point-to-point link between earth and planet which are separated by a distance of 12×10^{10} m. If the frame size is 512KB, what is the channel utilization using i) a stop-and-wait protocol ii) a sliding window protocol with a window size of 8
Hint: The time takes to keep the ACK on the channel is 1msec and processing time of data/ack frame is 0.1msec.

2B. i) Ten thousand airline reservation stations are competing for the use of a single slotted ALOHA channel. On average, each station makes 24 requests/hour. A slot is 25μsec. What is the approximate total channel load?
ii) A network of 'N' stations share a 56-kbps channel using slotted ALOHA protocol. Each station outputs a frame whose size is 800-bits on an average of once every 100sec, even if the previous one has not yet been sent (e.g., the stations can buffer outgoing frames). What is the maximum possible number of nodes in the network?

(5 + 5)

3A. For the given DLL frame bits 110010101100, find CRC and transmitted string if the generator polynomial is 11001.

3B. Use Bellman-Ford algorithm to find the shortest path between 'A' and all the remaining nodes in the following weighted graph. And update the routing table if the link is broken between nodes 'E' and 'G'. (Note: all the route updates must be in the form of Table)



(5 + 5)

4A. One of the IP addresses in a block is 168.210.150.0/18. The ISP needs to distribute these addresses to three groups of customers as follows:
a. The first group has 54 customers; each needs 250 addresses.
b. The second group has 120 customers; each needs 120 addresses.
c. The third group has 68 customers; each needs 14 addresses.
Design the subblocks and find out how many addresses are still available after these allocations.

4B. If either sender's application or receiver's application or both are generating data very slowly, how TCP addresses these problems. Explain in detail.

(5 + 5)

5A. How DNS maps the Domain names to an IP address? Mention the steps.

5B. Draw the IPv4 header and explain each field in detail.

(5 + 5)

6A. Assume a discrete channel impulse response is used to model urban RF radio channels with excess delays as large as 100μs and microcellular channels with excess delays no larger than 4μs. If the number of multipath bins is fixed at 64, find (a) $\Delta\tau$ (b) the max. RF BW which the SMRCIM models can accurately represent.
Repeat the problem for an indoor channel model with excess delays as large as 500ns.
Note: Quantizing the delay bins determine the time delay resolution of the channel model, and the channel model used to analyze Tx RF signals having BWs < $2/\Delta\tau$

6B. A mobile phone is located 5km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55dB to receive cellular radio signals. The E-field at 1km from the Tx is measured to be 10^{-3}V/m. The carrier frequency used for this system is 900MHz. Find: i) length and the aperture area of the receiving antenna. ii) received power at the mobile using the 2-ray ground reflection model assuming the height of the Tx antenna is 50m and the receiving antenna is 1.5m above ground.

(5 + 5)