1. What are the basic components of Internet?

2. What are the differences between
   a. Client-Server model and Peer-to-Peer model
   b. Circuit switching and packet switching
   c. Frequency division multiplexing (FDM) and Time division multiplexing (TDM)
   State as many differences as possible.

3. Similar to the numerical example on delay as discussed in the class ...Consider the following scenario:
   a. A is transmitting M number of packets to B. Each of the packet size is L Megabit. There are N routers in between A and B. Each of the link speed is R Mbps (Megabit per second). How long does it take for B to receive all M packets from A? Assume zero propagation delay, zero nodal processing delay and zero queuing delay.

4. Suppose there are 35 users generating packets at random with probability 0.4 (i.e., each user is “ON” 40% of the time on an average). A packet occupies an entire time slot (i.e., transmission time is 1 time unit) and every user’s timeslots are synchronized. A packet is transmitted as soon as it is generated (i.e., it is transmitted instantaneously) at the beginning of a timeslot. Write a program to simulate the packet generation for 1000 time slots and gather the following.
a. How many packets were generated by all the users in the network in that time (1000 time slots)?

b. Find the fraction of this time (1000 slots) when there were exactly \( k = 10, 15, \) and 20 packets generated in the network? (Note: you can potentially have 0 to 35 packets at any time slot.)

c. Repeat part (b) for all values of \( k \) from 0 to 35. Plot (histogram) these fractions (\( k \) on the x-axis and the corresponding fractions on the y-axis). (Note: These fractions are nothing but the probability of having \( k \) packets in any time slot.)

d. Suppose the system can handle at most 18 packets at any point of time. That means the system would drop additional packets if more than 18 packets are generated at any point of time. (For example, the link would drop 6 if 24 are generated).
   1. How many packets are dropped in 1000 time slots?
   2. Express that as a fraction of the total number of packets generated to obtain the packet dropping probability.

Submit your source code of the program along with the above results.

5. [10] For the same scenario as in Problem 4, run the simulation for 100,000 time slots.
   a. Plot as in 4(c). What observation do you make when you plot this extended simulation time?

   b. Also, find the packet dropping probability now (as was done in 4(d)). What observation do you make when you compare this result with that of 4(d).

Submit your source code of the program along with the above results.

Show your answers and steps clearly.