

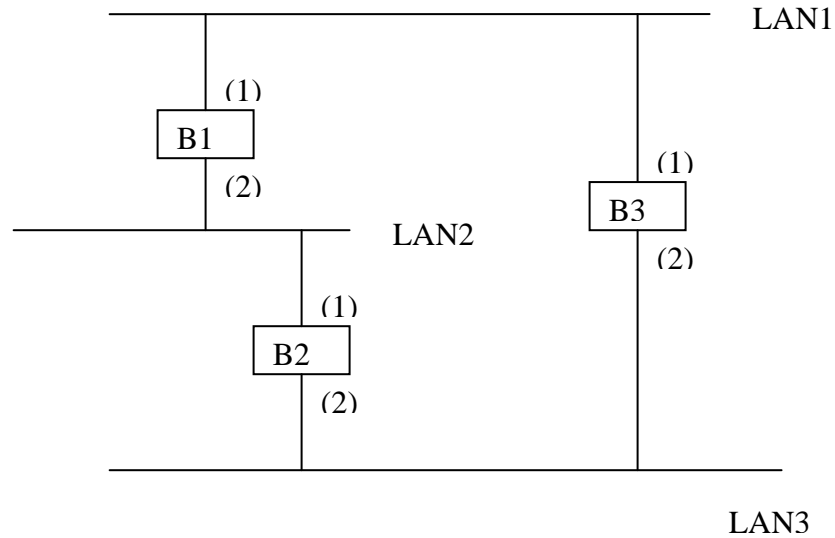
**Concordia University**  
**ELEC6851 – Telecommunication Networks**

Midterm Exam

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- 1) a) What is the minimum time required to send a L1-byte frame from station A to station B and to receive a L2-byte acknowledgment? Assume that the distance from A to B is  $d$ , the speed of light in cable is  $v$ , and the transmission rate is  $R$ . (5 Marks)  
b) Suppose transmission channels become virtually error-free. Is the data link layer still needed? Explain. (5 Marks)  
c) Which of the TCP/IP transport protocol (UDP or TCP) would you select for the following applications: packet voice, file transfer, remote login? (5 Marks)
- 2) Which OSI layer is responsible for the following (15 Marks)
  - a) Determining the best path to route packets
  - b) Providing end-to-end communications with reliable service
  - c) Providing reliable service between adjacent nodes in a network
- 3) Suppose that the TCP entity receives a 1.5 megabyte file from the application layer and that the IP layer is willing to carry blocks of maximum size 1500 bytes. Calculate the amount of overhead incurred from segmenting the file into packet-sized units. Assume that in each packet, TCP has 20 bytes of header and IP has 20 bytes of header. (10 Marks)
- 4)  $M$  stations are attached to a hub in a star topology. The distance from each station to the hub is 100 meters. The speed of the transmission lines is 100Mbps. All frames are of length 1500 bytes. The signal propagates on the line at a speed of  $2.5 \times 10^8$  m/sec. Find the maximum network throughput achievable in bits/second when the hub is implementing CSMA-CD and slotted ALOHA respectively? (20 Marks)

- 5) Determine the spanning tree for the following network. Explain your steps. Costs assigned to each LAN are assumed to be equal. If station A on LAN1 sends a frame to station B on LAN3, what is the path that the frame will take? (20 Marks)



- 6) Consider a reservation system with  $N$  stations. The length of each minislot is  $m$  bits and the information in minislots is always received error free. Each station has a message to transmit during a cycle with probability  $q$  and no message with probability  $1-q$ . Message lengths are  $n$  bits and messages may be received in error by destinations. Assume that each bit of a message may be received in error with probability  $p$  by a destination. A frame is discarded if received with one or more bit errors. The transmission rate on the channel is  $R$  bps and the propagation delays are negligible.
- Determine the average duration of a cycle. (10 Marks)
  - Determine the throughput of this system. (10 Marks)