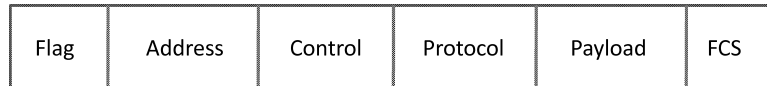


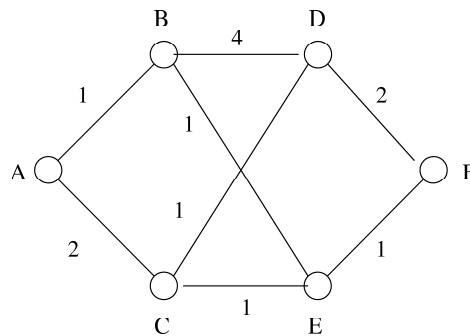
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- All solutions should be properly written and justified.
  - All calculations have to be shown.
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1. a) Determine whether the following statements are true or false. Each correct answer gives 0.5 points, each wrong answer -0.75 points and unanswered statement 0 points. (The total score of the question cannot be less than zero)
    - i) A full-duplex line could carry traffic in both directions, but only in one direction at the time.
    - ii) Switching in the Internet is done by using the IP at the transport layer.
    - iii) The syntax of a protocol refers to the structure and format of the data.
    - iv) There exists a minimum size of an Ethernet frame.
    - v) The PPP and UDP protocols are found on the same level in the OSI model.
    - vi) The BGP (Border Gateway Protocol) uses path vector routing.
    - vii) Bit stuffing is used to get the HDLC frame to be a multiple of 8 bits.
    - viii) An IPv4 address is 40 bits long.
    - ix) An ARP request is broadcast, and an ARP reply is unicast.
    - x) The Internet uses a flat name space.
  - b) Explain the difference between *circuit switching* and *virtual circuit*. (1.5p)
  - c) Assume that the primary HDLC station has sent 2 I-frames to a secondary. The primary's N(S) count was five (101 binary) prior to sending the two frames. If the poll bit is set in the second frame, what will be the value of N(R) back from the secondary after the last frame? (1.5p)
  - d) What is the differences between open-loop congestion and closed-loop congestion control? (2p)
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2. a) How does a bridge work? On which level is a bridge operating? Which types of networks could be connected by a bridge? (2p)
  - b) Could the HDLC protocol be used on a LAN to provide the protocol generating the frames? (1,5p)
  - c) Find the checksum of the following bit sequence. Assume a 16-bit segment size.  
110111010010000111110001101000111101100001000100 (2p)
  - d) How does the collision detection work in Token Bus? (1,5p)
  - e) In GSM only a rather limited number of traffic channels exist (i.e. 180), how could these serve magnitudes of more GSM calls at the same time? (2p)
  - f) What is the first host address in a IPv4 network which includes the address 121.34.167.112 and has a mask of 255.255.254.0? (1p)

3. a) Describe each field in the PPP frame below thoroughly. (3p)



- b) A frame with the length 12 bits should be transmitted from the sender to the receiver. The frame consists of 8 bits data and 4 bits FCS.
- Which P (polynomial) should be used:  $P=101$ ,  $P=1011$  or  $P=10011$ ?
  - Which is the bit pattern of the transmitted frame if the message is  $M=10011001$ ? (2p)
- c) What would be the CIDR ( $\backslash n$ ) notation for a classful A address? (1p)
- d) Which of the following access methods would you choose to implement in a satellite system? (ALOHA, CSMA, TOKEN) (1.5p)
- e) Describe the concept of a proxy firewall. (1.5p)
- f) What does the term *piggybacked acknowledgement* mean? (1p)
4. a) In ATM there exist both VP and VC, explain the difference between these two. (1.5p)
- b) Use Dijkstra's algorithm to compute the shortest path from **node D** to every other node. (2.5p)



- c) Show router N's routing table after processing the distance vector update from router M. (2p)

Next	Hops	Router
A	3	Y
B	2	W
D	4	W
F	4	W

Router N table

Next	Hops	Router
A	2	Y
B	2	Z
C	3	W
D	2	W
F	4	X

Router M table

- d) How, and by whom, is the addresses for a computer set on level 2 and level 3? Is it possible to change these addresses, and if so, how? (2.5p)
- e) Describe how a peer-to-peer TCP connection is teared down. (1.5p)

