**ECGR3123 Data Communications and Networking**
**Summer Term**

**Homework Assignment 1**

1) (8 points) Match the following functions to one of the five TCP/IP layers:

    a) Making sure that the transmitted data frames do not overflow at the receiver's buffer:
    b) Performing data compression:
    c) Specifying the number of pins in an RS-232 connector:
    d) End-to-end flow control:
    e) Encoding a bit into appropriate signals such as voltage levels for transmission :
    f) Recovering from errors caused by a noisy channel:
    g) Determining the route for forwarding packets to the final destination :
    h) Detecting errors :

2) (8 points) A TCP segment consisting of 1000 bits of data and 150 bits of header is sent to the IP layer, which appends another 150 bits of header. This is then transmitted through three networks, each of which uses a 24-bit packet header. The destination network has a maximum packet size of 600 bits. How many bits, including headers, are delivered to the network layer protocol at the destination?

3) (4 points) In protocol layer structure, one protocol data unit (PDU) in layer *N* is encapsulated in a PDU at layer (*N*-1) and a (*N*-1)-header is added. It is also possible to break one *N*-level PDU into multiple (*N*-1)-level PDUs

(segmentation) or to group multiple *N*-level PDUs into one (*N*-1)-level PDU (blocking).

a) In the case of segmentation, is it necessary that each (*N*-1)-level segment contain a copy of the *N*-level header? Please explain your answer.

b) In the case of blocking, is it necessary that each *N*-level PDU retain its own header, or can the data be consolidated into a single *N*-level PDU with a single *N*-level header? Please explain your answer.