Unit 3: The Networking Section

Lesson 25: Networks, Protocols, Transmission

(a) Describe the TCP/IP model, the functions performed by each layer, and the process of encapsulation.
(b) Define the function of a protocol.
(e) Summarize the principles behind the design of the Internet Protocol.
(f) Define the structure of an IP address and define the purpose of network masking.
i) Define the process of routing packets and routers creating tables.

NOTE: The lesson notes listed ten objectives, but only the above five will be testable.

Lesson 26: CAN 1

(a) List three advantages of CAN
(b) Explain the process for bus arbitration for CAN.
(c) Given multiple message ID’s, determine which message would be sent based on the bus arbitration process.
(d) List three advantages of the CAN bus arbitration process.
(e) Given an example of a CAN data frame, determine the arbitration field, control field, data field, cyclic redundancy field, and acknowledgement field.

Lesson 27: CAN 2

(a) Explain the purpose for termination resistors and calculate the appropriate resistance.
(b) Calculate the characteristic impedance for a cable
(c) Given specifications of cable length and nominal propagation speed, determine end-to-end propagation delay.
(d) Explain the relationship between CAN bit synchronization, timing & propagation delay.
(e) Describe the process for CAN bit synchronization and explain the use of “bit stuffing”.
(f) List the five types of CAN errors and the conditions under which they occur

Lesson 28: CAN 3

(a) Explain the purpose of application layer protocols (such as CANopen) and some of the functionality CANopen provides.
(b) Given an 11-bit message ID in the CANopen DS-401 Generic I/O format, determine the Comm Object type and the Node ID.
(c) Explain the difference between a Transmit Process Data Object (TPDO), a Receive Process Data Object (RPDO), and a Service Data Object (SDO).
(d) Given the eight bytes of data associated with a TPDO 2 Comm Object (in CANopen DS-401 Generic I/O format), determine the voltage levels of the four MicroMod analog inputs (A0,A1,A2,A3).
Lesson 29: CAN 4

(a) Describe two CAN physical vulnerabilities.
(b) Describe two CAN logical link (i.e. data link) vulnerabilities.
(c) Describe two CANopen vulnerabilities.
(d) Explain how an “intruder” node could take control of a physical device (such as a motor) which is currently being controlled by another node (e.g. how your mbed took control of the motor which the MicroMod had been controlling in Lab 4).