Model Exam Paper in CN101.3 Data Communication and Networks

Content covered in lectures

- Lecture 1: Introduction
- Lecture 2: The need for Protocols
- Lecture 3: Protocol Architectures
- Lecture 4: Data Transmission
- Lecture 5: Transmission Media
- Lecture 6: Signal Encoding Techniques
- Lecture 7: Error Detection and Correction
- Lecture 8: Data Link Control Protocols
- Lecture 9: Multiplexing
- Lecture 10: WAN Technology

Question 1

- (a) Name the layers in OSI ISO protocol architecture model from top to bottom. (7 marks)
- (b) Mention at least one function provided by each layer. (7 marks)
- (c) Provide an example protocol for each layer. (7 marks)
- (d) What are the main differences in IPv4 and IPv6? (4 marks)

[Total = 25 marks]

Question 2

- Sketch the signal waveforms for the bit stream 11001010 encoded using:
- (i) NRZ – L
- (ii) NRZ – I: Assume that the signal level for the preceding bit (last bit before the above bit stream) was low.
- (iii) Bipolar AMI: Assume that the most recent 1 bit had a negative value.
- (iv) Pseudoternary: Assume that the most recent 0 bit had a negative value.
- (v) Manchester
- NOTE: You will receive marks for clear, labelled diagrams.
- [5 x 5 = 25 marks]
- **[Total = 25 marks]**

Question 3

- (a) *In data transmission, long messages are broken down into a number of short frames*. Explain the reasons for doing so, and then how the data is transmitted.
  (10 marks)
- (b) Explain how the Selective Reject ARQ operates by sketching three separate timing diagrams (similar to Fig. Q3), under the following three scenarios:
- (i) Five data frames transferred without any errors;
- (ii) Frame 3 is lost in transit;
- (iii) Acknowledgement from Frame 5 is lost.

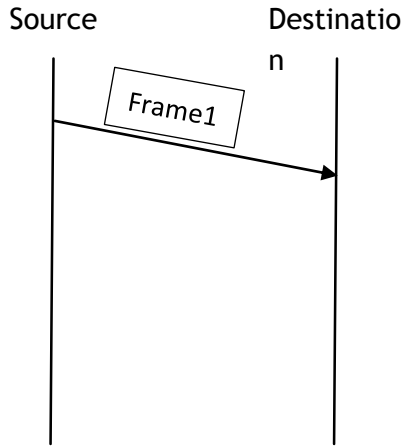

Fig. Q3

- (3 x 5 = 15 marks)
- **[Total = 25 marks]**

Question 4

- (a) Imagine that there are 30 telephone channels, and each channel has a bandwidth of 4 kHz. Explain with suitable sketches how you would use:
  - (i) Time division multiplexing (TDM)
  - (ii) Frequency division multiplexing (FDM)

  to transmit these channels. With TDM you should select suitable time slots, and with FDM you should select suitable carrier frequencies and a modulation scheme.

  (2 x 5 = 10 marks)

- (b) In data communication, packet switching is used, however, in voice communication, circuit switching is used. Explain the reasons for doing so.

  (8 marks)

- (c) Datagram and virtual circuit are two techniques used in packet switching. Explain the differences between the two techniques.

  (7 marks)

[Total = 25 marks]