National School of Business Management
BSc (Hons) Software Engineering/Computer Networks/Computer Security
March 2017
CN101.3 Data Communication and Networks – Model Exam Paper

Time: 3 hours
Answer *all* questions. 100 marks in total.   **Date:**

1. (a) Name the layers in OSI ISO protocol architecture model from top to bottom.   (5 marks)

   (b) Mention at least one function provided by each layer.   (5 marks)

   (c) Provide an example protocol for each layer.   (5 marks)

   (d) What are the main differences in IPv4 and IPv6?   (5 marks)

2.   (a) Explain the difference between Manchester encoding and differential Manchester encoding by sketching the waveforms for the following code: 10011101

                                                                                                         (8 marks)

   (b) Amplitude Modulation (AM), Frequency Modulation (FM) and Phase Modulation (PM) are three analog modulation techniques used in data communication. Explain each of these modulation technique with suitable diagrams. Your explanation should include a sketch of the modulating signal as well as the modulated signal for each technique.

                                                                                             (3 x 4 = 12 marks)

3. (a) *In data transmission, long messages are broken down into a number of short frames*. Explain this statement. (5 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;
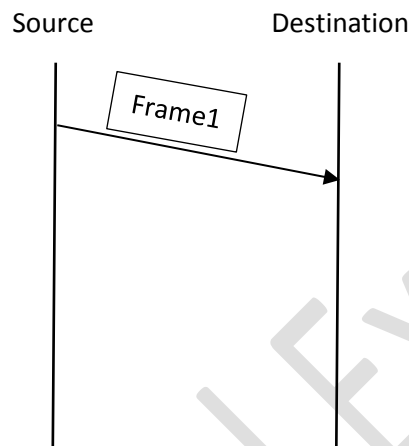(iii) Acknowledgement from Frame 5 is lost.

Fig. Q3

(3 x 5 = 15 marks)

4. (a) Imagine that there are 30 telephone channels, and each channel has a bandwidth of 4 kHz. Explain 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.

(10 marks)

5.   (a)   Compare layer 2 of IEEE 802 reference model with OSI reference model layer 2. What are the similarities and differences?

(6 marks)

(b)   Compare and contrast the functions performed by a hub and layer 2 switch.

(4 marks)

(c)   Ethernet technology is a popular technology used in wired local area networks. What are the transmission media used with Ethernet?

(4 marks)

(d)   List the IEEE 802.3 100Mbps Specifications (Fast Ethernet).

(6 marks)

*****