THE OPEN UNIVERSITY OF SRI LANKA

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

B. SC. DEGREE PROGRAMME 2013/2014
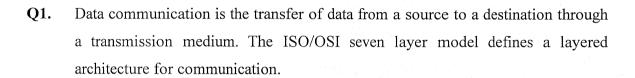
FINAL EXAMINATION

CPU3152: DATA COMMUNICATION

DURATION: TWO HOURS (2 HOURS)

Date: 25.11.2014	Time: 9.30 am – 11.30 am

Answer **FOUR** Questions **ONLY**. All questions carry equal marks.

Q1. Data communication is the transfer of data from a source to a destination through a transmission medium. The ISO/OSI seven layer model defines a layered architecture for communication.

    (i) Briefly explain the following terms.

        a. Line configuration

        b. Multiplexing

        c. Modulation

    (ii) Considering the ISO/OSI model, where does the **line configuration** fit in the layered architecture? Draw the diagram for a **star configuration** of a mail server and three clients.

    (iii) Briefly explain how the **sliding window protocol** functions.

Q2. Digital data can be transferred over a transmission medium through digital encoding systems.

    (i) Briefly describe the **advantages and disadvantages** of using **NRZ-L** and **Manchester encoding** systems in data transmission.

    (ii) Draw a diagram to represent the bit stream 100110011 in **NRZ-L, NRZ-I** and **Bipolar – AMI.** Clearly state the **polarity** and **voltage level** including the **axis names.**

    (iii) What is meant by **synchronization** in encoding schemes?

Q3. Digital data can be transferred through a transmission medium in the form of analog signals.

    (i)   Briefly explain the requirement for analog signals to transmit digital data.

    (ii)   State three analog encoding schemes and identify them in the form of sinusoidal waveform notation.

    (iii) Draw the signal diagram for each of the above, if the transmitted digital data stream is 1011.k

Q4. Explain the requirement of multiplexing systems in data communication.

    (i)   Distinguish between the basic multiplexing techniques.

    (ii)   Draw a diagram to explain the multiplexing function of **one of the above** using four inputs (A, B, C, D), in transmission medium, de-multiplexing at the receiver (Assume that the sequence being in alphabetical order and clearly indicate the domain according to the technique).

Q5. A picture file of 1 MB (megabytes) is saved in a personal computer. A transmission channel is capable of handling 100 kbps (kilobits per second) data rate. If the transmission system uses QPSK with 2 – Amplitudes, 8-Phases and 4 – frequencies;

    (i)   Draw a constellation diagram for the signals.

    (ii) Represent the bits to signal mapping.

    (iii) What is the minimum "**baud rate**" required to support the 100 kbps data rate?

Q6. A Radio broadcast is sampled at a rate of 40 kHz. If the sampling is done without compression and the 255 levels (positive and negative) are measured.

    (i)   What is the **bit rate** of the generated PCM signal?

    (ii)   If the bandwidth of the radio input (voice) is 20 kHz and f_c= 400 kHz, draw the frequency spectrum of the transmitted signal through **Amplitude modulation**.

    (iii) If a guard band of 10 kHz is required to avoid the interferences, calculate the adjacent **carrier frequency**.