THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF COMPUTER SCIENCE
B. SC. DEGREE PROGRAMME 2017/2018
FINAL EXAMINATION
CSU5307/ CPU3152: DATA COMMUNICATION
DURATION: TWO HOURS (2 HOURS)

Date: 07.04.2019 **Time: 9.30 am – 11.30 am**

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

Q1. Data communication simply is the transfer of data from a source to a destination through a transmission medium. ISO/OSI seven-layer model defines a layered architecture for data communication. Briefly explain the following terms.

a. Network Layer
b. Modulation
c. Frequency Modulation
d. Syntax of a protocol.
e. GSM

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

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

(ii) Draw a diagram to represent the bit stream **110011** in **NRZ-L**, **NRZ-I** and **Bipolar – AMI.** Clearly state the **polarity** and **voltage level** including the **axis names.**

Q3. Explain the requirement of multiplexing systems in data communication.

(i) Draw a diagram to explain the multiplexing function of **one of the above** using four inputs (X_1, X_2, X_3, X_4), in transmission medium, de-multiplexing at the receiver (Assume the sequence being in numerical order and clearly indicate the domain according to the technique explained).

Q4. Digital data can be transferred through transmission medium in the form of analog signals.

(i) Discuss the advantages and disadvantages of 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 **10101**.

Q5. A video file of 10 MB (megabytes) is saved in a web server. Transmission channel from the web server to the client PC is capable of handling 1 Mbps (megabits per second) data rate. If the transmission system uses QPSK with 4 – Amplitudes, 4 - Phases and 4 – carrier frequencies.

(i) Design a system of bits to signal mapping to achieve a minimum **baud rate.**

(ii) What is the minimum **"baud rate"** required to support the 4 Mbps data rate?

Q6. A voice signal is sampled at a rate of 16 kHz. The sampling is done without compression and 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 32 kHz and $\mathbf{f_c}$=88.3 MHz, draw the frequency spectrum of the transmitted signal through **amplitude modulation.**