THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF COMPUTER SCIENCE
B. SC. DEGREE PROGRAMME 2016/2017
FINAL EXAMINATION
CPU3152: DATA COMMUNICATION
DURATION: TWO HOURS (2 HOURS)

Date: 12.01.2018 **Time: 9.30 am – 11.30am**

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.

(i) Briefly explain the following terms.

a. Star topology

b. De-Multiplexing

c. Amplitude Modulation

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

(iii) Briefly explain the **error detection** function.

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 **110111** 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 transmission medium in the form of analog signals.

(i) Briefly explain the advantages 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 **01101**.

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_1, A_2, A_3, A_4), in transmission medium, de-multiplexing at the receiver (Assume the sequence being in alphabetical order and clearly indicate the domain according to the technique explained).

Q5. A picture file of 1 MB (megabytes) is saved in a personal computer. Transmission channel is capable of handling 200 kbps (kilobits per second) data rate. If the transmission system uses QPSK with 2 – Amplitudes, 2 - Phases and 2 – carrier frequencies.

(i) Draw a constellation diagram for all the signals.

(ii) What is the minimum "**baud rate**" required to support the 400 kbps data rate?

Q6. Standard voice in telecommunication is sampled at a rate of 8 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 16 kHz and $\mathbf{f_c}$=400 kHz, draw the frequency spectrum of the transmitted signal through **Amplitude modulation**.