THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
B. SC. DEGREE PROGRAMME 2019/2020
FINAL EXAMINATION
CSU5307/ CPU3152: DATA COMMUNICATION
DURATION: TWO HOURS (2 HOURS)

Date: 14.01.2019~~2019~~2020 **Time: 9.30am – 11.30 am**

Answer **FIVE** Questions. All questions carry equal marks.

Q1. Briefly explain the following terms.

a. Data-Link Layer
b. Home Location Register
c. Bearer Service
d. Quantization
e. ADSL

Q2. The amplitude modulation is the simplest form of the modulation. If the input signal is x(t) and carrier signal is, $Cos2\pi f_c t$ then the output signal after modulation can be given as, $S(t) = A.\ (\ 1 + \mu.x(t)\ ).\ Cos2\pi f_c t$

The parameter μ is known as modulation index and A is the amplitude of the modulated signal. For simplicity, A can be considered as 1 where there is unit amplitude for both input and carrier signals. The 1 represents the dc component to prevent loss of information. Considering $A= 1$ & $\mu = 1$;

(i). Draw the output signal, when x(t) is a sinusoidal signal with frequency of f_l and $f_c = 10 \times f_l$ with similar amplitude.
(ii). Draw the frequency spectrum of the output signal.

Q3. A video file of 100 MB (megabytes) is saved in a web server. Transmission channel from the web server to the client PC is capable of handling 10 Mbps (megabits per second) data rate. If the transmission system uses QPSK with 8 – Amplitudes, 4 - Phases and 2 – 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?

Q4. Explain the requirement of **TDM** and **FDM** systems in data communication.

(i) 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 numerical order and clearly indicate the domain according to the technique explained).

(ii) Identify the differences in **Time Division Duplex & Time Division Multiplexing**

Q5. 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 **010110**.

Q6. A voice signal is sampled at a rate of 8 kHz. If the sampling is done without compression and 63 levels (positive and negative) are measured.

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

(ii) If the bandwidth of the input (voice) is 32 kHz and what is the minimum bit rate required to transmit the voice through a PCM channel with similar number of quantization levels?

*****End of Examination Paper*****