MANIPAL INSTITUTE OF TECHNOLOGY
(A constituent unit of MAHE, Manipal 576104)

V SEM B. Tech.(BME) DEGREE END-SEMESTER EXAMINATIONS NOV/DEC 2018

SUBJECT: TELEMEDICINE (BME 3105)
(REVISED CREDIT SYSTEM)
Friday, 23rd November 2018: 2 PM to 5 PM

TIME: 3 HOURS   **MAX. MARKS: 50**

Instructions to Candidates:
1. Answer ALL questions. 2. Draw diagram wherever necessary.

1.   (a)   (i) A digital signal is to be transmitted through a channel having bandwidth of 4 KHz and data transmission speed of 56 Kbps. Determine the number of levels required to represent this data, and the SNR of the channel.   (2)

(ii) Explain with examples the different signal impairments that can affect the signal as it travels through the transmission media.   (3)

(b)   (i) Indicate whether frequency or amplitude of the signal is affected by phase-error in the synchronizing carrier used in the demodulation of DSB-SC signal? Prove the answer.   (5)

2.   (a)   (i) Draw the frequency spectrum of the SSB signal (upper sideband), if the modulating signal is $m(t) = \cos 2\pi.1000t + \cos 2\pi.2000t$ and the carrier is given by $c(t) = \cos 2\pi.10000t$.   (3)

(ii) Show that a phase modulated signal can be obtained using a frequency modulator.   (3)

(b)   (i) Pulse modulation systems are not completely digital in nature. Justify.   (2)

(ii) A periodic symmetric square wave of period 0.1 sec, frequency modulates a carrier producing a frequency deviation of 250 Hz. Assuming the square wave has significant frequency components up to 5th harmonic, determine the a) Deviation ratio   b) Bandwidth   c) Suppose the square wave modulating signal is amplified by a factor of 2, what is the new bandwidth of the FM signal?   (2)

3.   (a)   (i) A composite signal with a baseband frequency range from 0 to 4 MHz is transmitted by Pulse Code Modulation, using 8 bits per sample and a sampling rate of 10 MHz. a) Determine the number of quantization levels b) Calculate the transmission bit rate c) What is the type of noise induced in this process.   (3)

(ii) List the key advantages and disadvantages of digital representation of analog signals such as voice, image and video.   (2)

(b)   (i) Consider time-division multiplexing (TDM) of 5 PAM signals with sampling time of 1 msec. If the width of each sample pulse is 150 µsec, find the guard-time. If it is required to maintain the same guard-time to avoid interference between samples, find the new pulse width to transmit 10 PAM signals in 1 msec duration.   (4)

(ii) How can the effect of cross talk be reduced in the TDM signal?   (1)

4.   (a)   (i) Differentiate 'Time-Division Multiplexing (TDM)' from 'Time Division Multiple Access (TDMA)'.   (1)

(ii) Consider Global system for Mobile (GSM), which is a TDMA system that uses 25 MHz band, which is divided into radio channels of 200 KHz each. If 8 speech channels (time slots) are supported on a single radio channel, find the number of simultaneous users that can be accommodated in GSM, assuming no guard band.   (2)

(b)   (i) What are the different parameters that can be used for biometric security & identification? Explain any one in detail.   (2)

(ii) Explain in detail, how digital signature can be used for authentication of data.   (5)

5.   (a)   What is the purpose of providing HL-7 standard in healthcare? Explain with an example, a HL-7 message.   (3)

(b)   With a neat diagram, explain the basic components of a tele-radiology system. Also, mention the standard image format used for storing and exchanging radiology images.   (6+1)