Kaferelsheikh University		**Faculty of Engineering**
Department of Electrical Engineering		**Year: 3rd Electronics and**
Subject: Communication systems 2		**Electrical Communication**
Academic Number: ECE4116		**Final Exam: 2 pages**
Full Mark: 90 degree	**Date: 25 /12/2017**	**Time allowed: 3 h**

This Exam measures the ILOs [a8, a18, a25, b2, b15 ,c1, c13 and c15]

Answer the following questions:

[1] Question One: (20 Mark) *[measures ILOs of b15, c1,a18 and a25]*

A- The spectrum of a message signal is given by $M(f)=\begin{cases}\cos(\frac{\pi f}{800}).....-400\le f\le 400\\ 0.....OW\end{cases}$, the signal is sampled at a rate of 1kHz using flat-top pulses, with each pulse being of unit amplitude and duration 0.1 ms. **Determine and sketch** the spectrum of the PAM signal.

[C.1.1 *(7 marks)*]

B- i- **Explain** the principles of Time division multiplexing

ii- Twenty four voice signals are sampled uniformly and then time division multiplexed. The sampling operation uses flat top samples with 1μs duration. The synchronization is done by adding an extra pulse with the same duration. The highest frequency component of each voice signal is 3.4 kHz. **Determine** the spacing between successive pulses of the multiplexed signal.

[a.18.1*(8 marks)*]

C- Show that the performance of DPCM can be controlled by the design of prediction filter

[a.25.2 and b15*(5 marks)*]

[2] Question Two: (20 Mark) *[measures ILOs of C1,C13 and b15]*

A- **Analyze** the base band binary data transmission system to find the condition required to avoid Inter symbol interference (ISI).

[b.15.*1(7 marks)*]

B- A binary PCM system using NRZ signaling operates just above the error threshold with an average probability of error of 10^{-6}. Suppose that the signaling rate is doubled, **Determine** the new value of the average probability of error.

[C.13.2 *(6 marks)*]

C- **Design** an equalizer to eliminate the effect of a communication channel whose response to an input message, M(ω) is on the form of $C(\omega)=[a_1\exp(-j\omega T)+a_2\exp(-j2\omega T)]M(\omega)$, where T is the transmission delay.

[C.1.3 *7 marks)*]

[3] Question three: (20 Mark) *[measures ILOs of a8 and b15]*

A- **Identify** the metrics for choice of digital modulation scheme [a.8.1 *(6 marks)*]

B- **Explain** the operation of the demodulator for non coherent binary FSK [a.8.2 *(6 marks)*]

C- i- Draw a block diagram of QPSK generator

ii- Given the input binary sequence 1100100010, sketch the wave form of the in phase component, quadrature component and the output modulated wave using QPSK generator [b.15.2*(8 marks)*]

[4] Question four: (20 Mark) *[measures ILOs of a18 and c1]*

A- **State** the main differences between error correction block codes and convolutional codes [a.18.2 and b.2.2 *(6 marks)*]

B- Draw both the encoder shift registers and the encoder state diagram of the convolutional encoder with (n,k,K)=(2,1,3) [c.1.1 *(7 marks)*]

C- The previous encoder in part **B** is used to encode the following sequence 110010. **Find** the output coded sequence. [c.1.1 *(7 marks)*]

[5] Question five: (10 Mark) *[measures ILOs of a8 and c1]*

- With aid of diagrams, **Explain** the generation of Direct Sequence Spread spectrum (DSS). [a8.2 and c.1.1 *(10 marks)*]

Best Wishes

Committee of Correctors and Testers

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