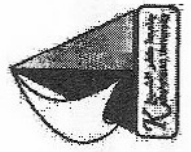


نظم اتصالات البيانات



Kafr Elsheikh University
Department of Electrical Engineering
Electrical Power and Machines Engineering program
Subject: Data Communication Systems(ECE3232)
full mark :90
Date:20/5/2018

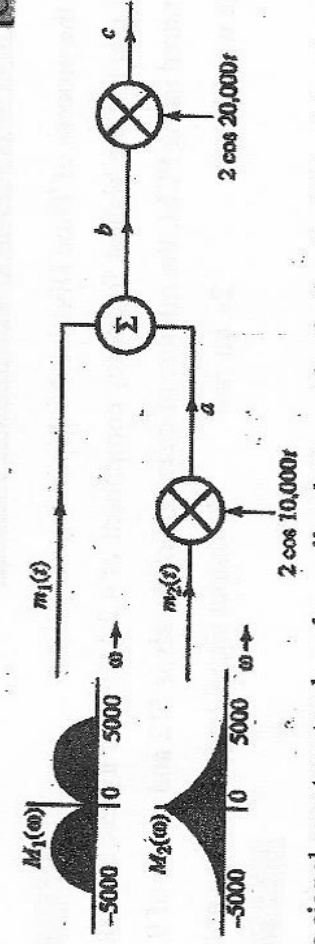
Faculty of Engineering
Time allowed: 3 hours
3rd year
final exam
Instructor: Dr. Shamia Ghamry

This Exam measures the ILOs [a2, a4, b1, b8, c1 and c3]

Answer The Following Questions

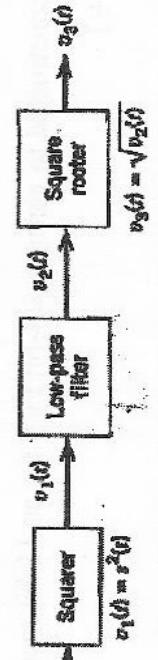
Question1[20 marks]: [measures ILOs of a2, b1 and c1]

- a- Two signals, both band limited to 5000 rad/s, are to be transmitted simultaneously over a channel by multiplexing scheme as shown in figure. The signal at point b is used to modulate a carrier of frequency of 20000 rad/s. the modulated signal at point c is transmitted over the channel. **[C.1.2 (7 marks)]**



- i- Sketch the signal spectra at a, b and c
- ii- what must be the band width of the channel
- iii- Design a receiver to recover the transmitted signals

- b- Prove that the following system can be used to demodulate (DSBSC)



- c- Explain the operation of envelop detector circuit in AM demodulation

Question2 [20 marks]: [measures ILOs of a4, c1 and c3]

- a- Explain, with the aid of sketches, how to generate SSBSC using filtering method and phase shift method illustrating the advantages and disadvantages of each method. **[a.4.1 (6 marks)]**
- b- Calculate the filter requirement to convert DSB signal to SSB Signal, given that the two side bands are separated by 200HZ. The suppressed carrier is 29MHZ. **[C.3.1 (4 marks)]**
- c- Calculate the percentage power saving when the carrier and one of the sidebands are suppressed in an AM wave modulated to a depth of i. 100 % ii. 50 %. **[4 marks]**
- d- Draw a block diagram of super heterodyne receiver.

If the range of frequencies which can be received by this system;(2.5 to 3.5) MHz and the IF frequency of this receiver is 500 kHz, Find the local oscillator range **[C.1.2 (6 marks)]**

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Question3 [15 marks]: *measures ILOs of a4 and c3*

- a- Explain the function of the hard limiter in FM demodulation based on frequency discrimination method. [a.4.1. (7 marks)]
- b- Design an Armstrong indirect FM modulator to generate an FM carrier with a carrier frequency of 100 MHz and $\nabla f = 20\text{KHz}$. A narrow band FM generator with $f_c = 200\text{ KHz}$ and ∇f of 10 Hz is available. There is an oscillator with adjustable frequency in the range of 9 to 10 MHz. there is a band pass filter with any center frequency, and only frequency doublers are available. Also, determine the percentage error in ∇f due to design. [C.3.1 (8 marks)]

Question4 [15 marks]: *measures ILOs of a2, b1 and b8*

- a- Explain the process of Time Division Multiplexing. [a.2.1 and a.2.2 (7 marks)]
- b- A signal that has the highest frequency component of 4.2 MHz and a peak to peak voltage of 4 volts is transmitted using PCM, the number of quantization levels is 512 and power of 0.04 watt. Calculate
- 1- Code word length
 - 2- bit rate
 - 3- output signal to quantization noise ratio
- [b.1.2 and b.8.2 (8 marks)]

Question5 [20 marks]: *measures ILOs of a2 and b1*

- a- - With aid of diagrams, Explain the generation of Direct Sequence Spread spectrum (DSS). [a.2.3 (8 marks)]
- b- A CRC is constructed to generate a 4-bit FCS for an 11-bit message, the generator polynomial is $X^4 + X^3 + 1$ [b.1.2 (12 marks)]
- i- Draw the circuit that would perform this task
 - ii- Encode the data bit sequence "10011011100", illustrating the operation of the generator through a truth table

Best Wishes

Committee of Correctors and Testers

Dr. Shamia Ghamry

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