LINCOLN UNIVERSITY COLLEGE

FACULTY OF ENGINEERING AND BUILT ENVIRONMENT

ELECTRONICS COMMUNICATION SYSTEM

DEE 4413

ASSIGNMENT (15%)

STUDENT NAME: Ho Weng Yin

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PROGRAMME: Diploma in Electrical Electronics Engineering (ODL)

SEMESTER: Y1S1

1) Explain in detail the communication system and explain the elements of communication systems.

(5 Marks)

2) A carrier wave of frequency 10 MHz and peak value 10V is amplitude modulated by a 5-kHz sine wave of amplitude 6V. Determine

(i) Modulation factor
(ii) Sideband frequencies
(iii) Amplitude of sideband components

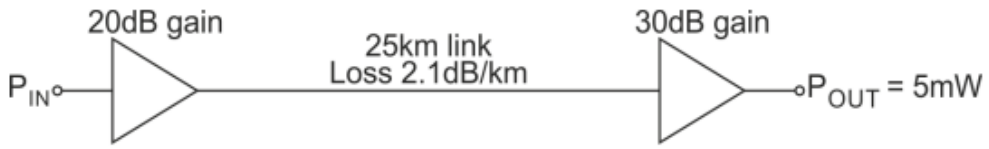
Then, draw the frequency spectrum.

(5 Marks)

3) Define the phase locked loop and draw the block diagram of the PLL.

(3 Marks)

4) Calculate the value P_{IN} for the following system:



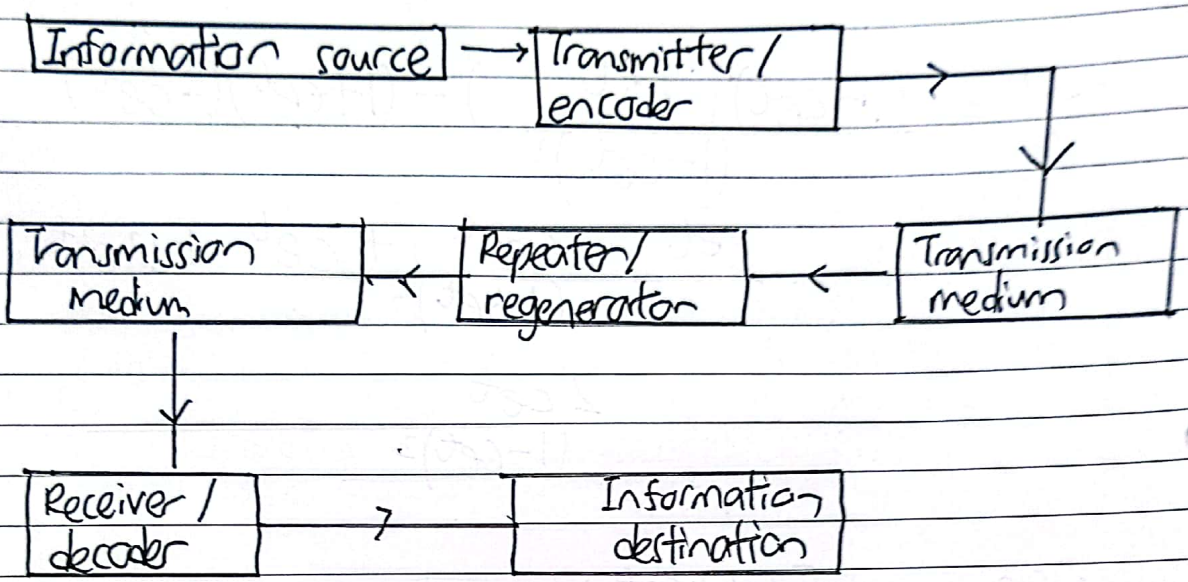
(2 Marks)

Subject:

No:

Date:

1) Explain in detail the communication system and explain the elements of communication systems.



1) Information source : This entity generates the information to be communicated and it could be a person, a computer, a sensor etc.

2) Transmitter / Encoder : The transmitter takes the information from the source and encodes it into a suitable format for transmission. This may involve converting analog signals to digital, modulation for radio transmission, or other encoding techniques.

3) Transmission medium : This is the physical pathway through which the encoded information is sent from the transmitter to the receiver. It could be a wire, fiber optic cable or wireless signals through the air.

4) Amplifier / Regenerator : In some cases, especially for long-distance communication, the signal may degrade as it travels through the transmission medium. Amplifiers or regenerators may be used to boost the signal strength or regenerate the signal to maintain its integrity.

Subject:

No:

Date:

5) Receiver / Decoder: The receiver is responsible for capturing the transmitted signal from the medium and decoding it back into a format that can be understood by the intended receipient. This involves processes such as demodulation, decoding and error correction.

6) Information Destination: This is the final destination of the communicated information. It could be another person, a computer, a storage device, or any entity that receives and utilizes the information for its intended purpose.

Subject: No:
Date:

2) A carrier wave of frequency 10 MHz and peak value 10V is amplitude modulated by a 5-kHz sine wave of amplitude 6V. Determine
i) modulation factor
ii) Sideband frequency
iii) Amplitude of sideband components

Then, draw the frequency spectrum

i) The modulation factor, also known as the modulation index, is given by

$$m = \frac{A_m}{A_c}$$, where A_m = amplitude of the modulating signal
A_c = amplitude of the carrier signal

$$m = \frac{6V}{10V} = 0.6$$

ii) Sideband frequency are given by:

$f_{sideband} = f_c \pm f_m$, where $f_{sideband}$ = sideband frequency
f_c = frequency of the carrier signal
f_m = frequency of the modulating signal

$f_{sideband} = 10MHz \pm 5kHz$

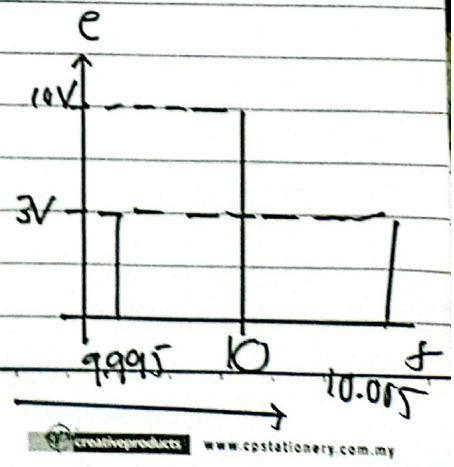
So sideband ~~frequency~~ frequencies are $10MHz + 5kHz$ and $10MHz - 5kHz$

iii) Amplitude of sideband components:

~~$A_{sideband} = m \cdot A_c = 0.6(10V) = 6V$~~

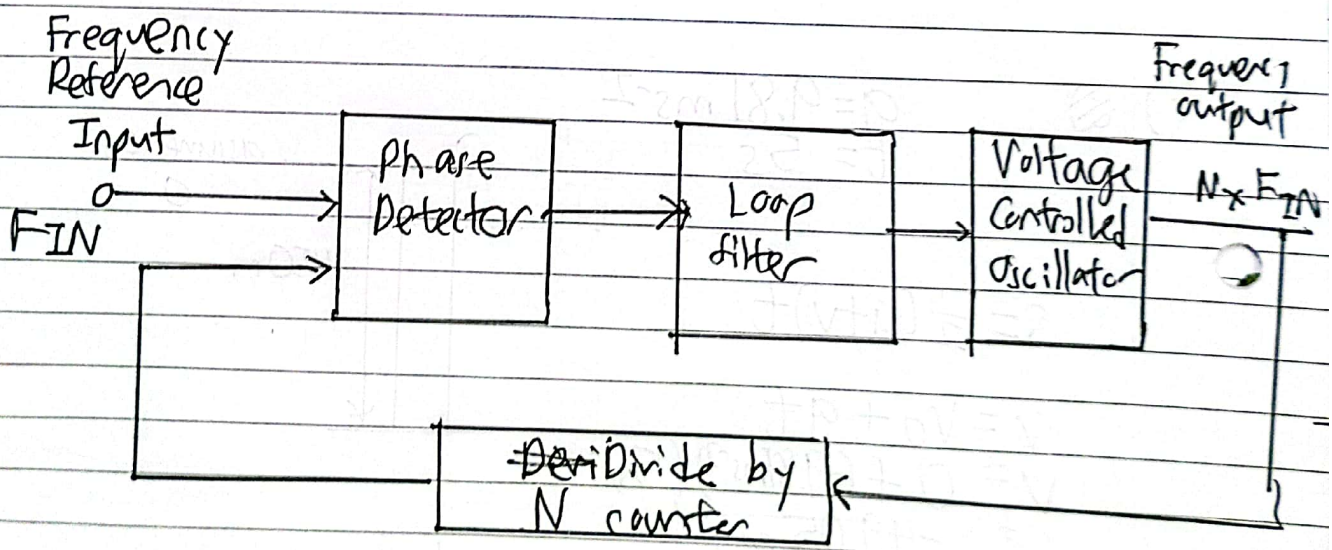
Amplitude of each sideband $= \frac{mE_c}{2} = \frac{0.6 \times 10}{2}$

$= 3V$

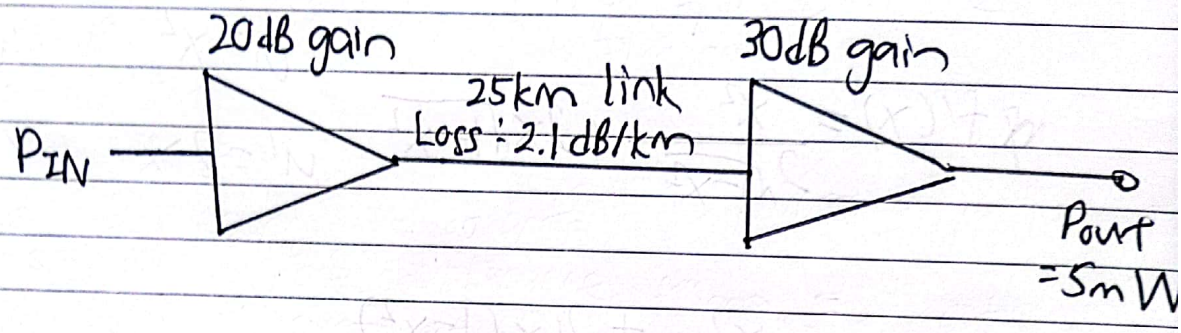


3) Define the phase locked loop and draw the block diagram of the PLL.

PLL stands for 'Phase-Locked Loop' and it is basically a closed loop frequency control system, which functioning is based on the phase difference between the input and output signals of the controlled oscillator (CO)
The phase locked loop method of frequency synthesis is now the most commonly used method of producing high frequency oscillations between in modern communications equipment.
PLL circuits are now frequently being used to ~~demodu~~ demodulate FM signals, making obsolete the Foster-Seerly and radio detectors of the early years. Other application for PLL circuits include AM demodulators, FSK decoders, two-tone decoders and motor speed controls



4) Calculate the value of P_{IN} for the following system



Loss in link = $25 \times -2.1 = -52.5$ dB

Overall Gain / Loss

$= 20 - 52.5 + 30$

$= -2.5$ dB

$$G_{dB} = -2.5 = 10 \log_{10}\left(\frac{5}{P_{IN}}\right)$$

$$-0.25 = \log_{10}\left(\frac{5}{P_{IN}}\right)$$

$$10^{-0.25} = \frac{5}{P_{IN}}$$

$$P_{IN} = \frac{5}{10^{-0.25}}$$

$$= \frac{5}{0.562} = 8.97 \text{ mW}$$