

Department of Electronics and Telecommunication Engineering
University of Moratuwa

B.Sc. (Eng) Semester 5
EN3013 – Analog Circuit Design
Laboratory Experiment - 2

Name : _____
Index No: _____
Date : _____

Lab: Analog Lab
Group: _____
Field: EN/BM

Marks:

Analog Mixers

Objective

To learn about the analog mixers (unbalanced frequency mixers) using diodes by experimental work.

Equipment

- DC power supply
- Function Generators (2 nos)
- CRO
- Spectrum Analyzer
- Protoboard

Components

- Diode (1N4148)
- 741 Op-Amp
- Resistors (1k – 2nos, 10k), capacitors (85pF), inductors (300u)

Theory

A mixer converts a signal from one frequency to another and it requires a nonlinear transfer function. In a receiver, this conversion is from radio frequency (RF) to an intermediate frequency (IF), or to baseband for a direct conversion receiver. In a transmitter, this conversion is from baseband or some intermediate frequency up to the radio frequency. A circuit realizing such nonlinearity can be implemented using a simple diode followed by some filtering to remove unwanted components.

Procedure

Step 1

- 1.0 Connect the circuit as shown in Figure 1. Apply a 1MHz carrier sine wave at S1 and a 10kHz triangular wave at S2. Set an appropriate offset to your inputs.

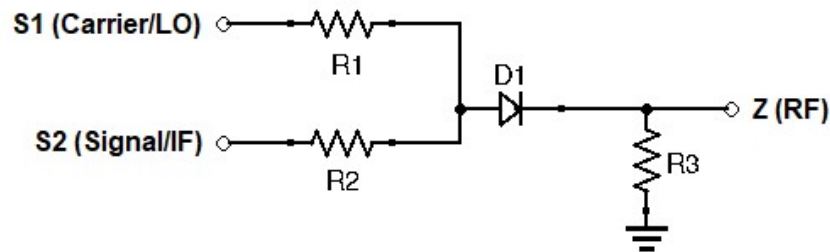
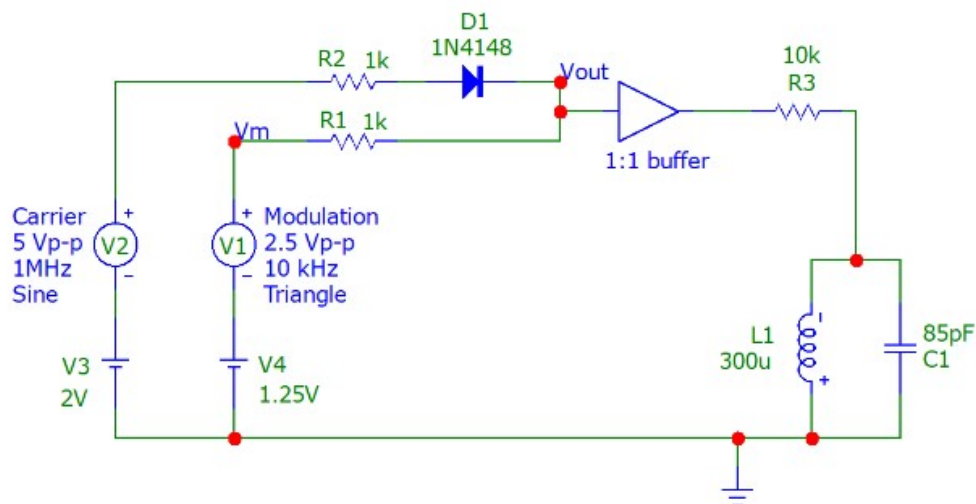


Figure 1: Diode Mixer

- 2.0 Observe the frequency spectrum of the RF signal at the output Z.
- 3.0 Adjust the values of R1 and R2 to get a better spectrum.
- 4.0 How does the diode generate new frequencies at the output?
- 5.0 Identify improvements which need to be done at the RF signal.
- 6.0 Implement a simple filter to clean the RF signal.

Step 2

- 7.0 Connect the circuit as shown in Figure 2.



- 8.0 Observe the frequency components at the output.
- 9.0 Comment on your observations and suggest improvements.