

# MMI504

## Audio Analysis and Synthesis

### Exercise .2

1. Modulate the amplitude of a 500Hz sine wave with a 20Hz sine wave.

Repeat the above by varying the frequency of the modulating sine wave with time from 1Hz to 5kHz.

$$y(t) = (A + m(t))\sin(\omega_c t)$$

2. Modulate the frequency of a 220Hz sine wave with a 22Hz sine wave.

Repeat the above by varying the frequency of the modulating sine wave with time from 1Hz to 1kHz.

$$y(t) = A \sin(\omega(t)t)$$

$$\omega(t) = \omega_c + m(t)$$

3. Wave Terrain Synthesis:

Create a 3D plot of the given equation:

$$z = \sin^2 x - \sin^2 y \quad 0 < x < 2\pi, 0 < y < 2\pi$$

Index it with a circular orbit around 0.5 such that the resulting output is of the form :

$$z = \sin^5 x * \sin^3 y$$

where  $x = -0.5 + \sin(2*\pi*f*t)$  and  $y = -0.5 + r*\sin(2*\pi*f*t)$

Plot the spectrograms for all the outputs to visualize the changes in frequency with time.

MATLAB functions : *mesh*, *specgram*, *linspace*