NATIONAL UNIVERSITY OF SCIENCES & TECHNOLOGY

Communication Systems (EE-351)

Assignment 1 (CLO-1)

Group Members

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Submission Details

Submitted to:	Dr. Huma Ghafoor
Class:	BEE-12C
Semester:	6th

- **No late submissions will be accepted unless a prior approval from the instructor is obtained with extremely genuine reasons. The assignments submitted after the due date/time will be graded zero.**
- **University has zero tolerance for plagiarism and serious penalties apply.**
- **All assignments found mutually copied will be marked zero.**
- **Five marks are reserved for neat and clean work.**

Problem No. 1:

Using the message signal

$$m(t) = \frac{t}{1 + t^2}$$

determine and sketch the modulated wave for amplitude modulation whose percentage modulation equals the following values:

(a) 50 percent

(b) 100 percent

(c) 125 percent

Plot the signals in MATLAB.

(15 marks)

Problem No. 2:

An angle modulated signal with carrier frequency $2\pi \times 10^5$ is described by the equation:

$$s(t) = 20 \cos [\omega_c t + 10 \sin 2\pi 3000t + 20 \cos 2\pi\, 2000t]$$

1. Calculate frequency deviation? Show all steps. [12 marks]
2. Modulation index? (2 marks)
3. Phase deviation? (2 marks)
4. Power of the modulated signal? (2 marks)
5. Carrier swing? (2 marks)

(20 marks)

Problem # 1

Using the message signal

$$m(t) = \frac{t}{1 + t^2}$$

determine and sketch the modulated wave for amplitude modulation whose percentage modulation equals the following values:

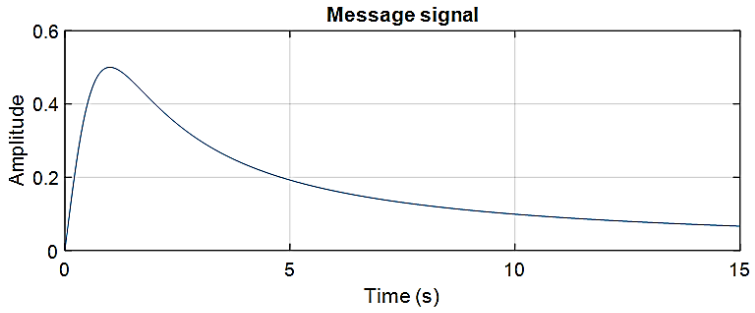
(a) 50 percent

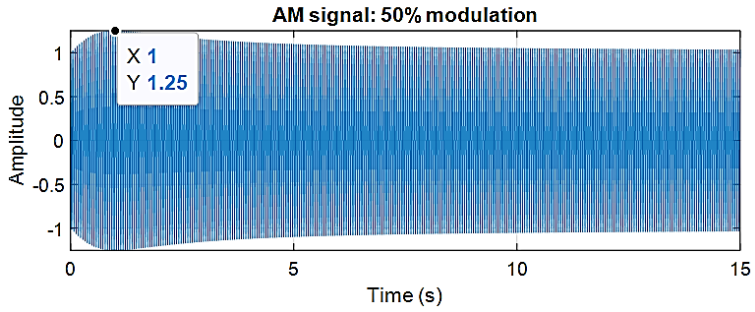
(b) 100 percent

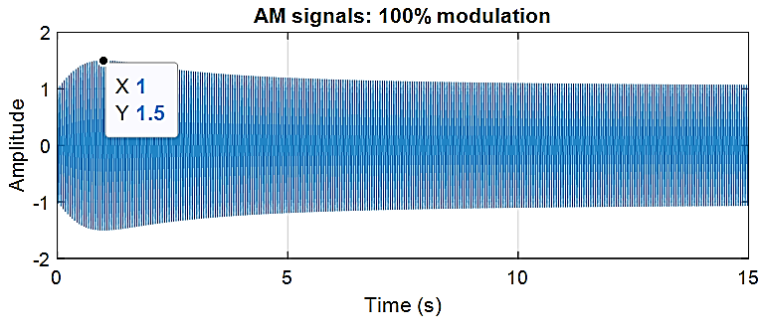
(c) 125 percent

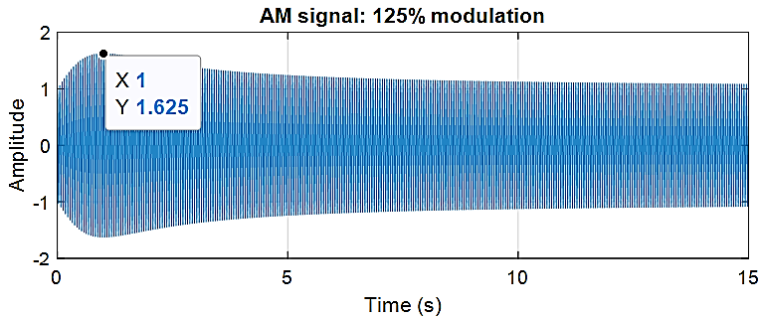
Plot the signals in MATLAB.

```
% Define parameters
fc = 20;
fs = 10 * fc;
T = 1 / fs;
t = 0:T:15;
m_t = t ./ (1 + t .^ 2);
c_t = cos(2 * pi * fc * t);

% Define sensitivity list
k_a_50 = 0.5;
k_a_100 = 1.0;
k_a_125 = 1.25;

% Define AM signals
s_t_50 = (1 + k_a_50 * m_t) .* c_t;
s_t_100 = (1 + k_a_100 * m_t) .* c_t;
s_t_125 = (1 + k_a_125 * m_t) .* c_t;

% Plot message signal and AM signals
figure
subplot(2, 1, 1)
plot(t, m_t)
title('Message signal')
xlabel('Time (s)')
ylabel('Amplitude')
subplot(2, 1, 2)
plot(t, s_t_50)
grid
title('AM signal: 50% modulation')
xlabel('Time (s)')
ylabel('Amplitude')

subplot(2, 1, 2)
plot(t, s_t_100)
title('AM signals: 100% modulation')
xlabel('Time (s)')
ylabel('Amplitude')

subplot(2, 1, 2)
plot(t, s_t_125)
grid
title('AM signal: 125% modulation')
xlabel('Time (s)')
ylabel('Amplitude')
```









Problem # 2

Done by hand on appended pages.