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Matéria: TELC11A - Laboratório de Telecomunicações I

## **Lab 2: Modulação em Amplitude**

- 1) Implemente a equação (1) no Matlab e plot: o sinal de mensagem, a portadora e o sinal modulado AM-DSB. Utilize diversos índices de modulação ( $m = 0.3; 0.7; 1.0$  e  $1.4$ ).

Observe a envoltória do sinal modulado e tire conclusões. OBS: Considere  $x(t)$  um sinal senoidal com frequência de 5 a 10 vezes menor do que a da portadora.

**R:**

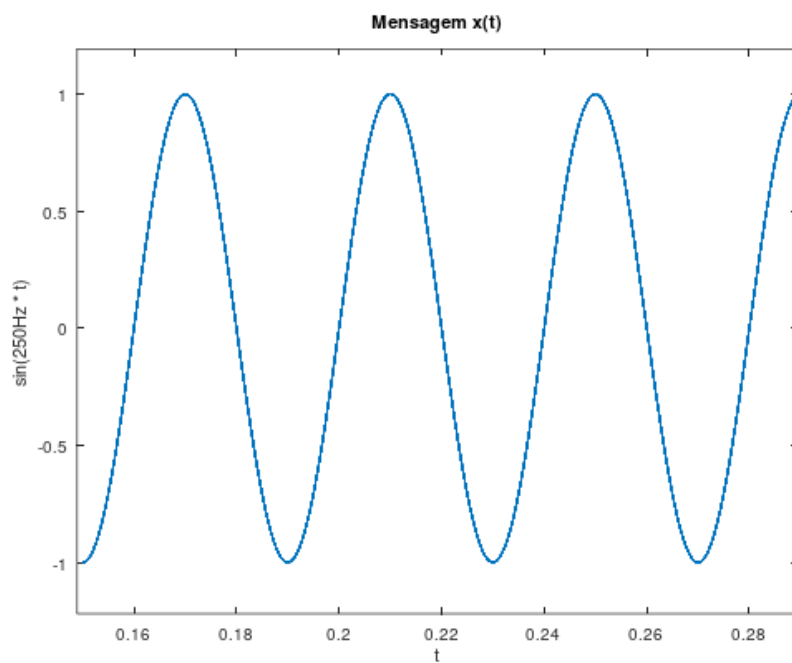
Script utilizado:

```

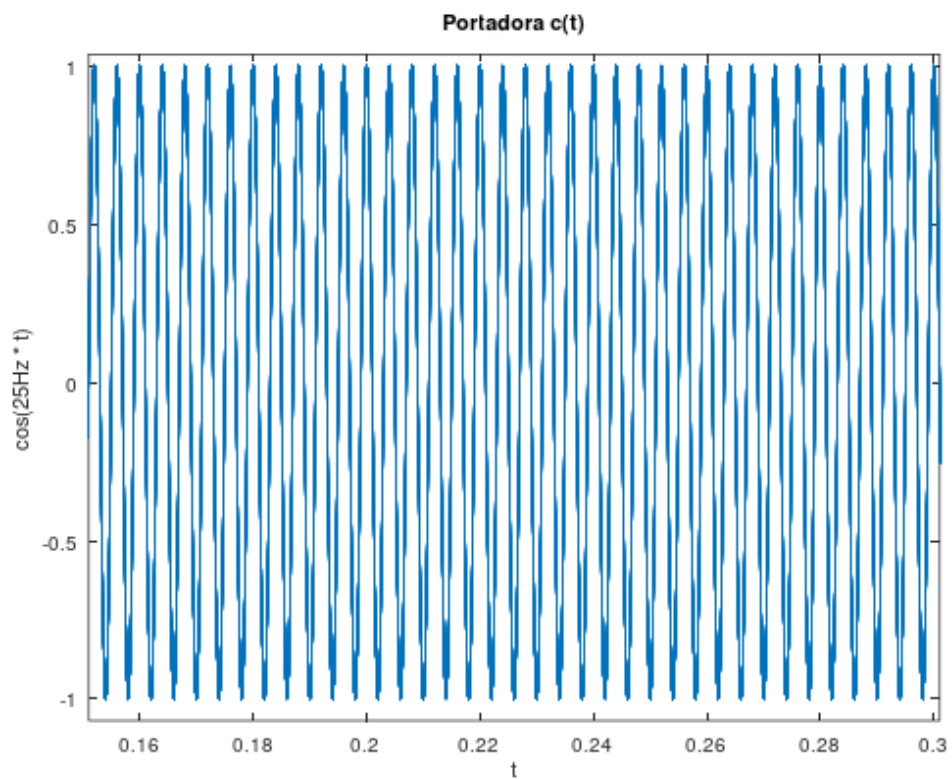
lab2.m
1 clear all;
2 close all;
3 clc;
4
5 amostra = 10000000;
6 t = 0.15 : 1/amostra : 1;
7
8 A = 1;
9 xt = sin(2*pi*25*t);
10 ct = cos(2*pi*250*t);
11 m = 0.3;
12
13
14 st = A*(1 + m*xt).*ct;
15
16 n = length(t);
17 y_fft = abs(fft(st)/n);
18 f = amostra*(0:(n/2-1))/n;
19
20 St = fft(st);
21
22 figure;
23 plot(t, xt);
24 title("Mensagem x(t)");
25 xlabel("t");
26 ylabel("sin(250Hz * t)");
27
28 figure;
29 plot(t, ct);
30 title("Portadora c(t)");
31 xlabel("t");
32 ylabel("cos(25Hz * t)");
33
34 figure;
35 plot(t, st);
36 title("Sinal Modulado s(t) para m = 0.3");
37 xlabel("t");
38 ylabel("s(t)");
39

```

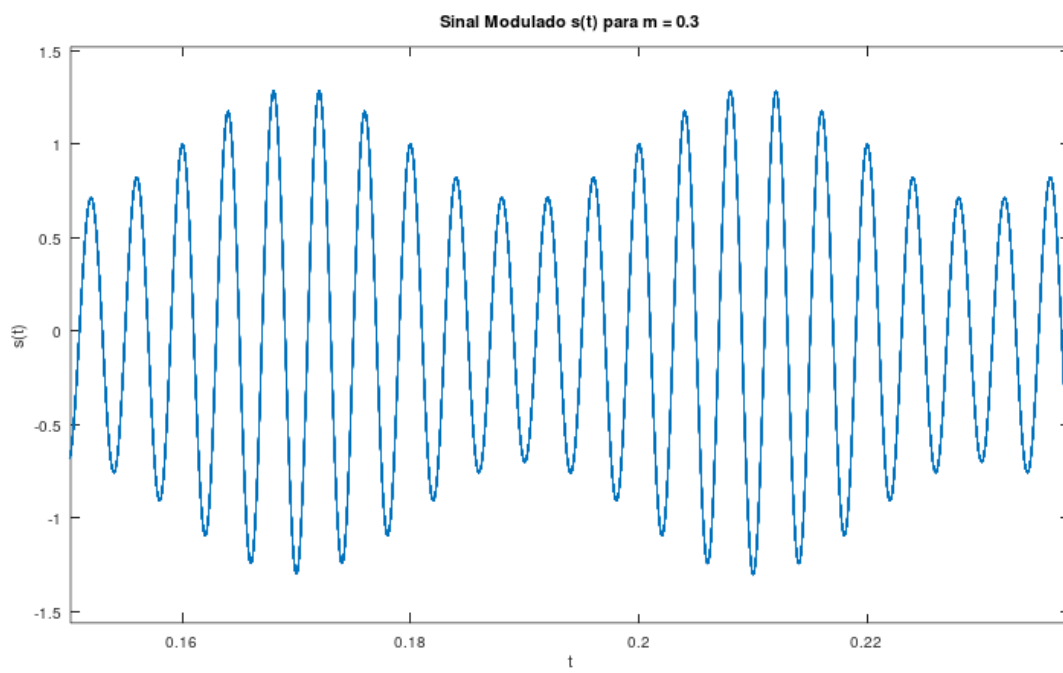
Mensagem:



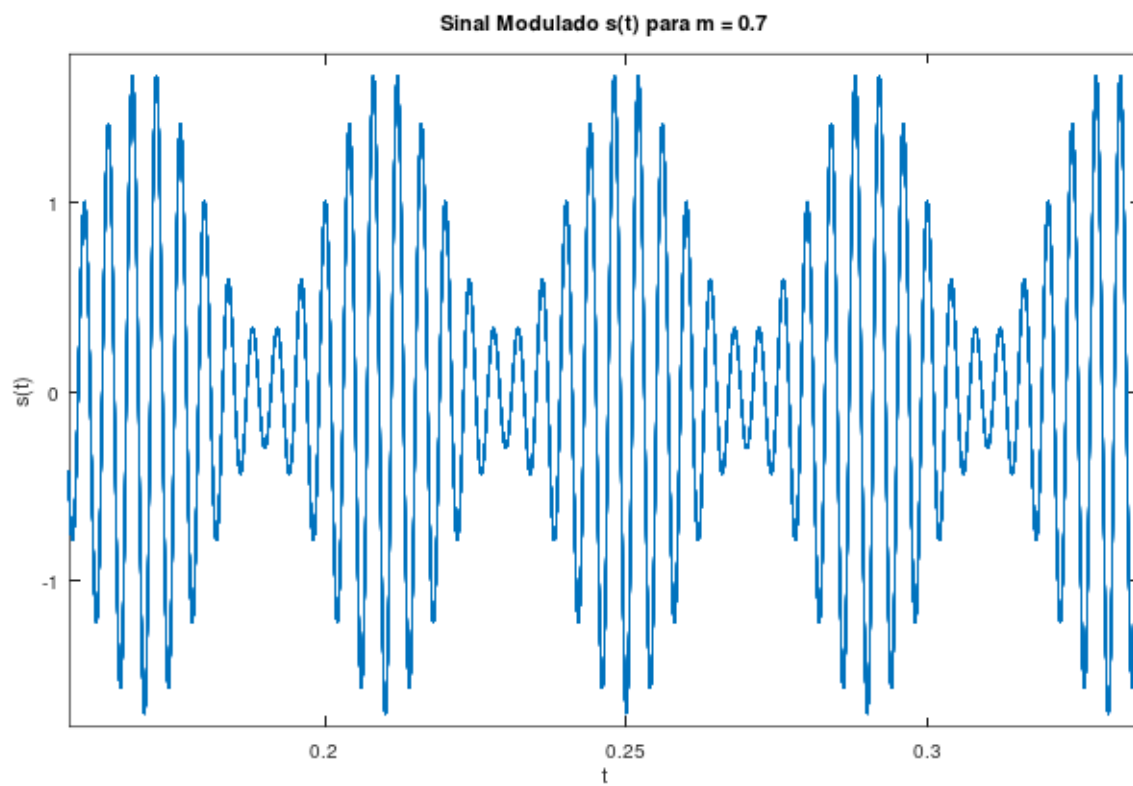
Portadora:



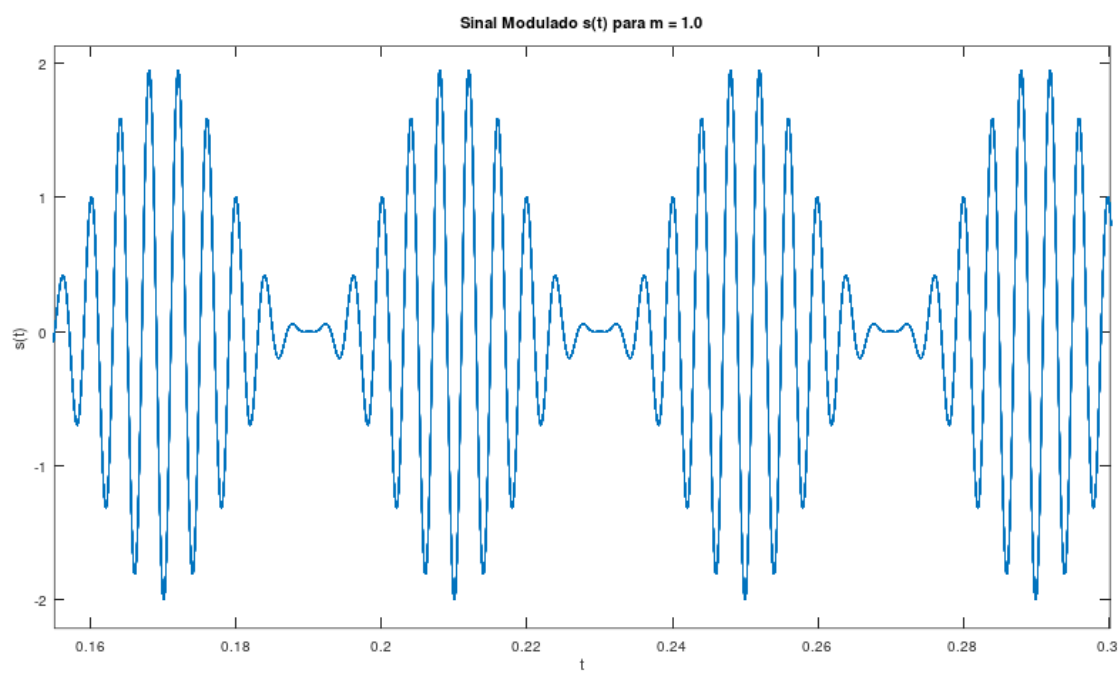
$m = 0.3$ :



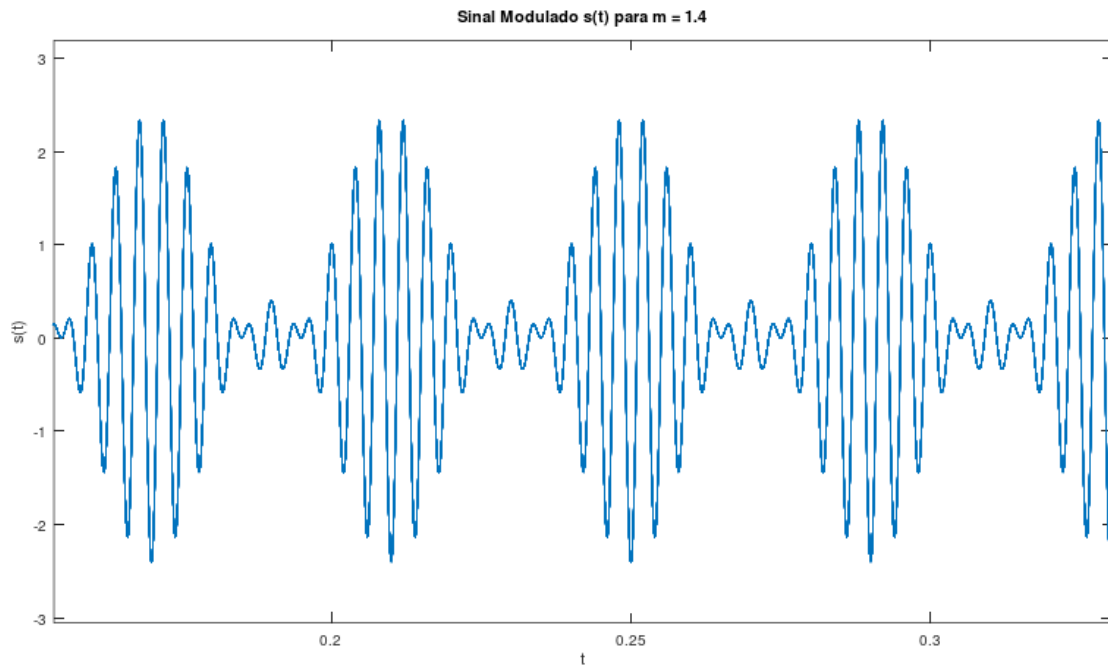
$m = 0.7$ :



$m = 1.0$ :



$m = 1.4$ :

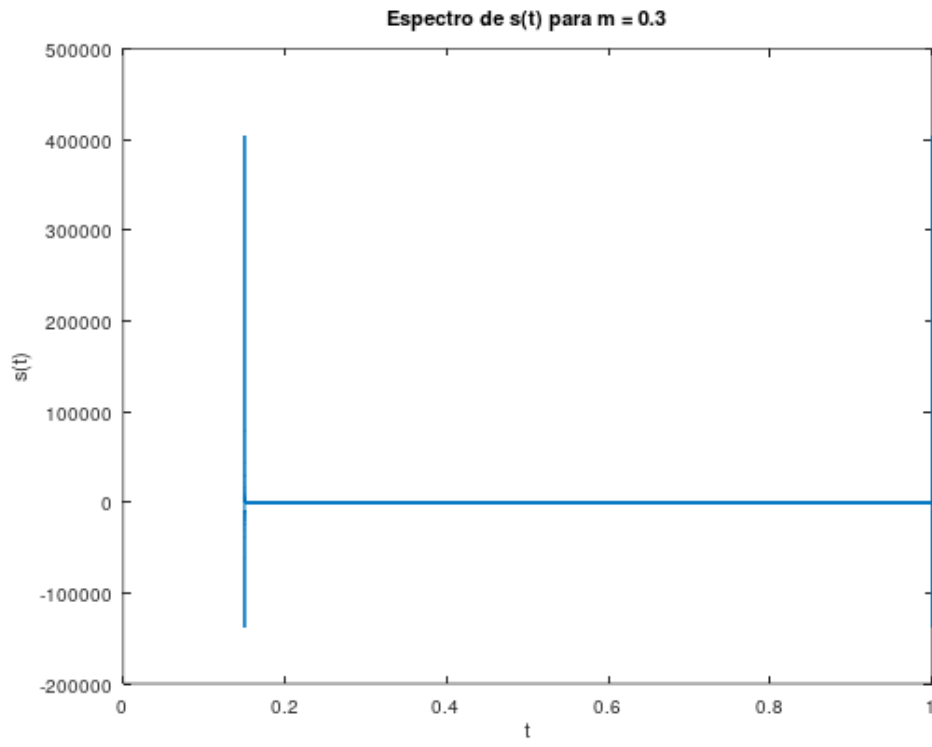


2)

Script:


```
36 St = fft(st);
37
38 figure;
39 plot(t, St);
40 title("Espectro de s(t) para m = 0.3");
41 xlabel("t");
42 ylabel("s(t)");
```

Espectro:



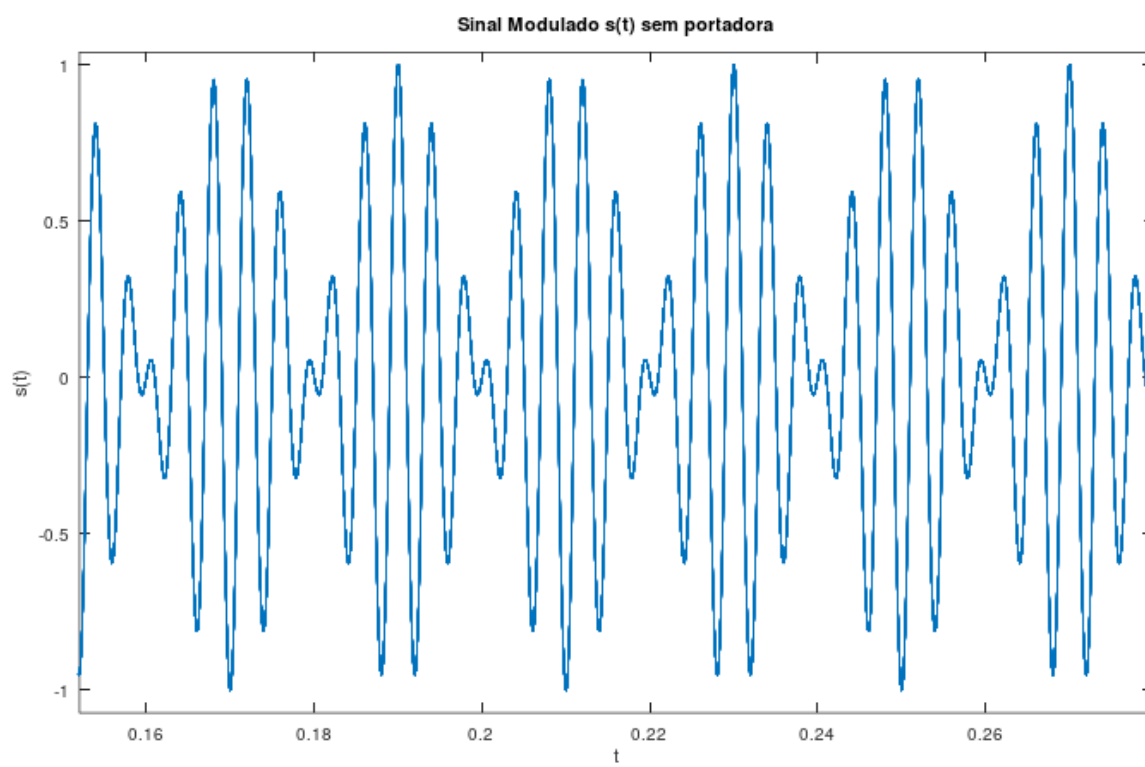
3)

Script:

```
lab2.m 
1  clear all;
2  close all;
3  clc;
4
5  amostra = 10000000;
6  t = 0.15 : 1/amostra : 1;
7
8  A = 1;
9  xt = sin(2*pi*25*t);
10 ct = cos(2*pi*250*t);
11 m = 0.3;
12
13
14 st = xt.*ct;
15
16
17
18 figure;
19 plot(t, xt);
20 title("Mensagem x(t)");
21 xlabel("t");
22 ylabel("sin(250Hz * t)");
23
24 figure;
25 plot(t, ct);
26 title("Portadora c(t)");
27 xlabel("t");
28 ylabel("cos(25Hz * t)");
29
30 figure;
31 plot(t, st);
32 title("Sinal Modulado s(t) sem portadora");
33 xlabel("t");
34 ylabel("s(t)");
35
```



Sinal Modulado:



Espectro:

