Amplitude Modulated Signal:

Let, modulating voltage be given by,

$$v_{\mathrm{m}} = V_m \, Sin \, \omega_m \mathrm{t}$$

Let, the carrier voltage is given by,

$$v_{\mathrm{c}} = V_c \, Sin(\omega_c \mathrm{t} + \theta)$$

So, the amplitude modulated wave is given by,

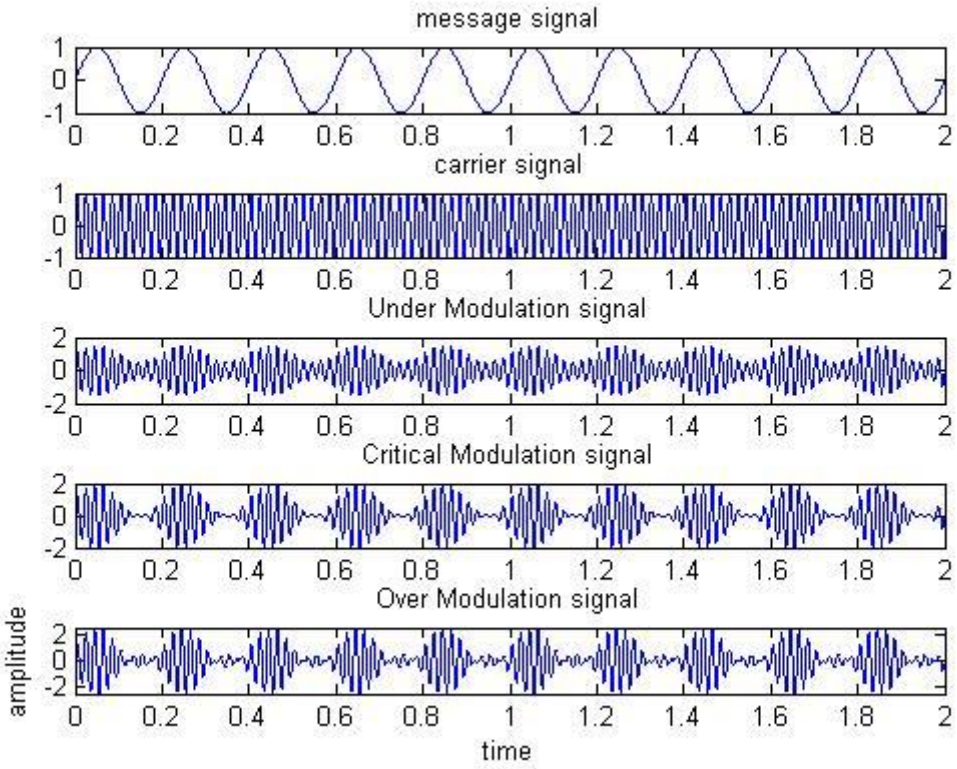
$v = V_c[1 + m_a Sin \, \omega_m t] Sin \, \omega_c t$ ---------- eq^n 3.8 from G.K. Mithal

Here, Modulation index $m_a = \frac{K_a V_m}{V_c}$ ---------- eq^n 3.9 from G.K. Mithal

Code in Matlab:

```
clc;
clear all;
close all;
t=[0:0.001:2];
f1=5; m=sin(2*pi*f1*t);
subplot(5,1,1);
plot(t,m); title('message signal');
f2=50; c=sin(2*pi*f2*t);
subplot(5,1,2);
plot(t,c); title('carrier signal');
m1=0.5;
s1=(1+(m1*m)).*c;
subplot(5,1,3);
plot(t,s1); title('Under Modulation signal');
m2=1;
s2=(1+(m2*m)).*c;
subplot(5,1,4);
plot(t,s2); title('Critical Modulation signal');
m3=1.5;
s3=(1+(m3*m)).*c;
subplot(5,1,5);
plot(t,s3); title('Over Modulation signal');
xlabel('time');
ylabel('amplitude');
axis([0,2,-2.5,2.5]);
```

Output:


message signal
carrier signal
Under Modulation signal
Critical Modulation signal
Over Modulation signal
amplitude
time