

SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY  
Department of Electrical and Electronic Engineering  
COMMUNICATION PRINCIPLES

**Assignment No. 5**

1. A triangular signal  $m(t) = 4\Lambda[(t - 6)/2]$  frequency modulates a carrier signal  $f(t) = 100 \cos(2\pi f_c t)$  with  $k_f = 30$  Hz/volt.
  - a. Sketch the instantaneous frequency deviation in hertz for the obtained FM signal.
  - b. Sketch the instantaneous phase deviation in radian for this FM signal.
  
2. An 18 MHz carrier is frequency modulated by a 400 Hz cosine waveform. If the FM signal has an amplitude of 5 volts and a peak frequency deviation of 30 KHz.
  - a. Write the expression for the obtained FM signal
  - b. Calculate the peak phase deviation in radian for this FM signal
  - c. Calculate the peak frequency deviation and the peak phase deviation if the frequency of the modulating signal is tripled.
  
3. A message signal  $m(t) = 0.5 \cos(2\pi 1000t)$  phase modulates a carrier signal  $f(t) = 10 \cos(2\pi 10^6 t)$  with modulation phase sensitivity  $k_p = 0.3$  rad/V.
  - a. Write the expression of the obtained PM signal.
  - b. Construct a phasor diagram for this PM signal.
  - c. Re-construct the phasor diagram if  $m(t) = 0.5 \sin(2\pi 1000t)$ .