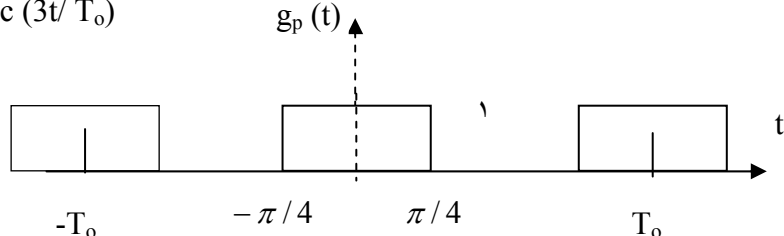




Question (1)

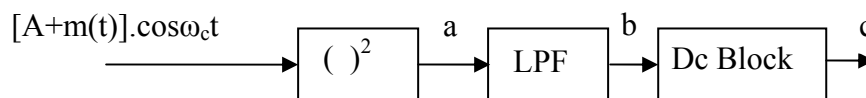
The periodic signal $g_p(t)$ shown below is passed through a filter with the impulse response of $h(t) = (3/T_0) \cdot \text{sinc}(3t/T_0)$

- (a) Find $H(F)$ for the filter
- (b) Find C_n of $g_p(t)$
- (c) Find the output power

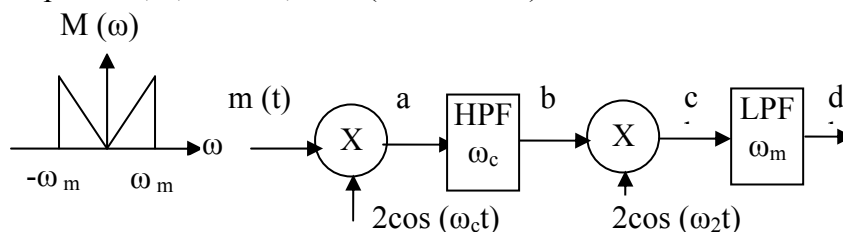


Question (2)

(a) This system shown below is used for AM Demodulation. Determine the signal at points a, b and c. Show that if $A \gg m(t)$, the distortion will be small.



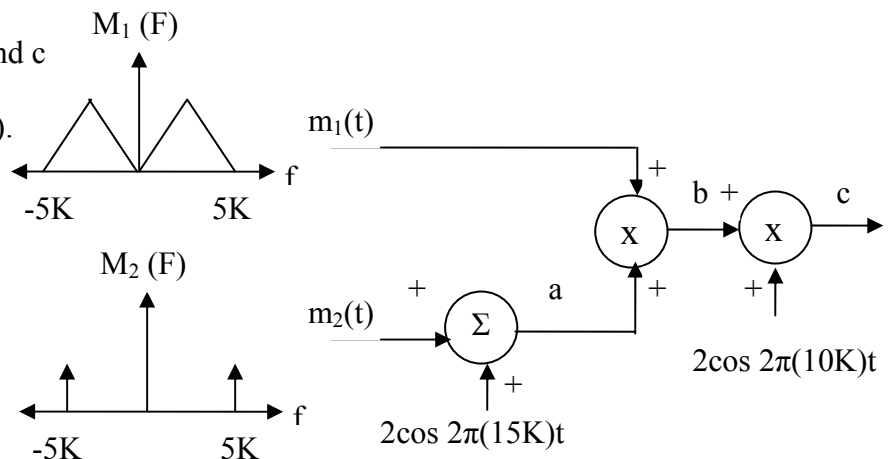
(b) The spectrum of a message signal $m(t)$ is shown below. Sketch the spectrum of the signal at all points a, b, c and d, Hint ($\omega_2 = \omega_c + \omega_m$)



Question (3)

Two signals $m_1(t)$ and $m_2(t)$, both are limited to 5000 Hz/sec, are transmitted simultaneously over a channel by multiplexing scheme shown below. The modulated signal at point c is transmitted over a channel.

- 1. Sketch the frequency Spectrum at points a, b and c
- 2. Calculate the bandwidth of the channel (at point c).



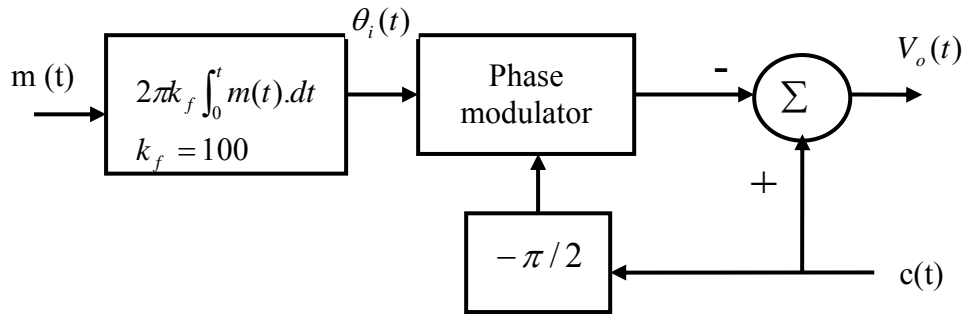
Please turn over

Question (4)

The block diagram shown below represents the generation for the narrow band frequency modulation (NBFM), where the base band is $m(t) = 10 \cos(2\pi 5000 t)$ and the carrier signal is $c(t) = 10 \cos(2\pi 10^5 t)$.

Find

- (a) The frequency deviation and modulation index
- (b) Sketch the spectrum for $V_o(t)$ and compare the results with AM



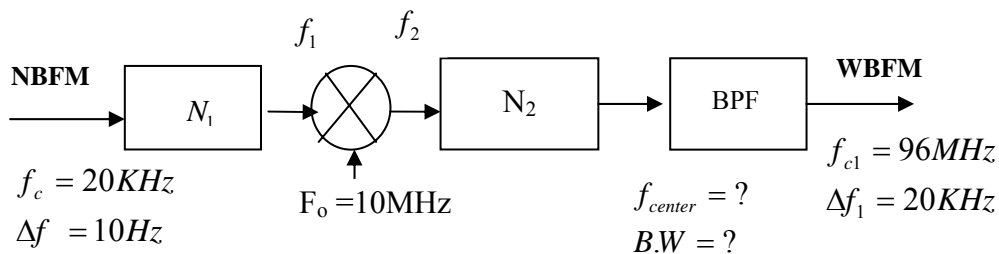
Question (5)

(a) An angle modulated signal with carrier frequency $\omega_c = 2\pi 10^5$ is described by

$$S(t) = 10 \cos[\omega_c t + 5 \sin 3000t + 10 \sin 2000\pi t], \text{ find}$$

- 1. The power of the modulated signal.
- 2. The frequency deviation Δf and the modulation index β .
- 3. Find the maximum value for $\theta_i(t)$ and the transmitted bandwidth.

(b) For the indirect modulator shown, find the N_1 , N_2 and the Bandpass filter center frequency and bandwidth



Question (6)

- 1. What are the properties of the digital over analogue?
- 2. What are the difference between the time division multiplex (TDM) and frequency division multiplex (FDM).
- 3. What are the main elements of the analogue to digital conversion
- 4. Three voice channels (each of $f_m = 3.4$ KHz) and three data channels (each of 10 KHz).
 - (a) Design TDM system and calculate the bandwidth for the uniform sampling
 - (b) Repeat step (a) for non-uniform sampling ($F_{frame} = 6.9$ KHz.)

Good Luck

