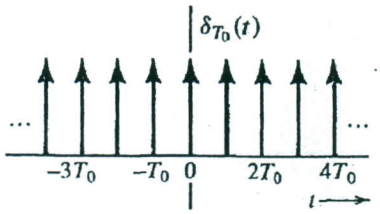
Mansoura University	**January 2014**	**Communication Systems**
Faculty of Engineering	**Time: 3 hours**	**Final Term Exam**
Elect. Eng. Department	**Marks: 110**	**Dr. S. Marzouk**

Question#1 (22 marks):

(a) Define modulation and explain why it is necessary or desirable. [6]
(b) Describe the fundamental parameters that control the rate and quality of information transmission. [5]
(c) Describe the different types of transmission modes. [5]
(d) Draw the block diagram of communication system and explain each block in detail. [6]

Question#2 (22 marks):

(a) Find the compact Fourier series of the periodic impulse train δ_{T_0} shown in the figure. [7]



(b) Find the inverse Fourier transform of the signal $G(\omega) = rect\left[\frac{\omega-4}{2}\right]$. [7]
(c) Explain one method for the detection of DSB-SC signal. [8]

Question#3 (24 marks):

(a) Describe the operation of a rectifier demodulator. [8]
(b) Explain the function and theory of operation of the mixer. [8]
(c) Show that demodulation of the VSB wave requires that the vestigial shaping filter transfer function, $H_i(\omega)$, and output LPF transfer function, $H_o(\omega)$, are related by:

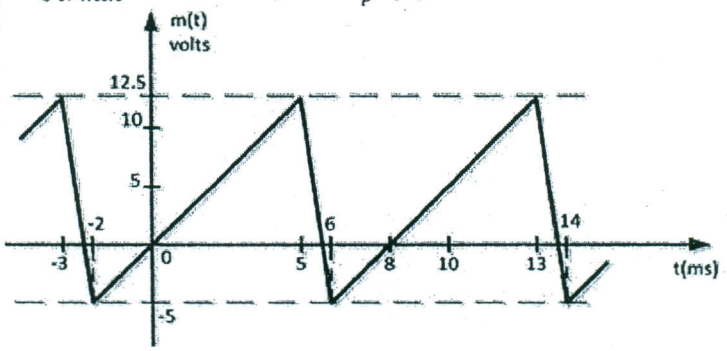
$$H_o(\omega) = \frac{1}{H_i(\omega + \omega_c) + H_i(\omega - \omega_c)} \quad |\omega| \leq 2\pi B$$

Question#4 (20 marks):

(a) Using block diagrams, show how a PM signal can be generated using FM modulator and how an FM signal can be generated using PM modulator. [8]
(b) Describe the operation of a phase-shift type SSB modulator. [6]
(c) Describe how to generate a narrow band FM wave (NBFM) and an NBPM wave. [6]

Question#5 (22 marks):

(a) An angle modulated signal given by, $\varphi_{EM}(t) = A\cos[2\pi \times 10^8 t + k_p m(t)]$, where $m(t)$ is as shown in the figure. If $(f_i)_{max} - (f_i)_{min} = 100$ kHz, find k_p. [6]



(b) For a modulating signal $m(t) = 2\cos 100t + 18\cos 2000\pi t$
1. Write expressions for $\varphi_{FM}(t)$ and $\varphi_{PM}(t)$ when $A = 10$, $\omega_c = 10^6$, $k_f = 1000\pi$, and $k_p = 1$. [8]
2. Estimate the bandwidths of $\varphi_{FM}(t)$ and $\varphi_{PM}(t)$. [8]