

أجب عن جميع الاسئلة

## السؤال الأول

1. Why do we need the modulation?
2. If you will make the station. which type of modulation will use AM or FM? Explain?
3. Explain briefly the Analog Pulse Modulation?
4. Why do not we use coherent detection in radio system?

## السؤال الثانى

1. Prove the sampling theorem for a signal whose spectrum is band-limited to  $f_m$  Hz, can be reconstructed exactly without any error from its samples taken uniformly at a rate  $f_s > 2f_m$  Hz.
2. A given AM broadcast station transmits a carrier power of 20Kw and use modulation index of 0.5 for sin wave modulation.  
Calculate:
  - The total power.
  - The transmission efficiency.

## السؤال الثالث

DSB-WC is generated using 1KHz carrier and input  $X(t) = \cos 200\pi t$  the modulation index is 80%. The lower side band is attenuated (assume ideal filter).

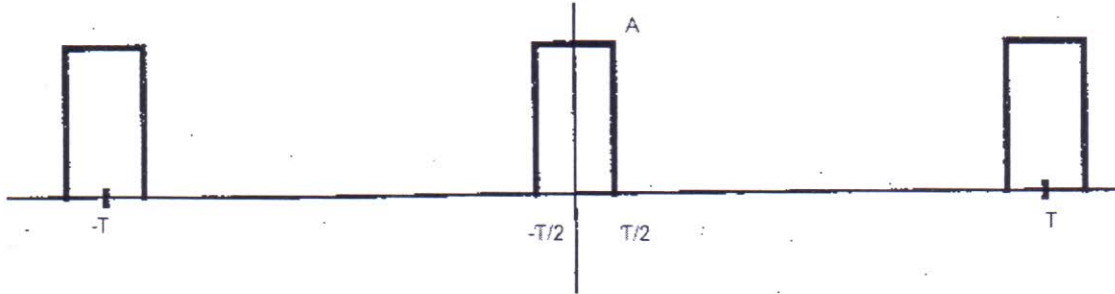
- 1 - Find the expression for the result signal.
- 2 - Find the signal power.

## السؤال الرابع

Carrier wave of amplitude 10V and frequency 100MHz is frequency modulated by a sinusoidal voltage. The modulating voltage has an amplitude of 5V and frequency  $f_m = 20k$  Hz. The frequency deviation constant is  $4\pi k$  Hz/volt. Draw the frequency spectrum of FM wave.

## السؤال الخامس

Obtain the Fourier series and Fourier transform for the rectangular pulse train shown in the figure



1. what the difference between :

- DSB-WC and DSB-SC
- DSB and SSB
- Coherent and envelop detection

## السؤال السادس

1. Consider the Two modulated signals:

$$X_1(t) = (2 + E_1 \cos w_m t) \cos w_c t$$

$$X_2(t) = E_2 \cos w_m t \cos w_c t$$

- Sketch the spectrum of the each signal.
- Determine  $E_1$ ,  $E_2$  to produce 100% modulation and the same average power



$m_1$	$J_0$ ( $m_f$ )	$J_1$ ( $m_f$ )	$J_2$ ( $m_f$ )	$J_3$ ( $m_f$ )	$J_4$ ( $m_f$ )	$J_5$ ( $m_f$ )	$J_6$ ( $m_f$ )	$J_7$ ( $m_f$ )	$J_8$ ( $m_f$ )	$J_9$ ( $m_f$ )	$J_{10}$ ( $m_f$ )	$J_{11}$ ( $m_f$ )	$J_{12}$ ( $m_f$ )	$J_{13}$ ( $m_f$ )	$J_{14}$ ( $m_f$ )
0.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.25	0.98	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-
0.5	0.94	0.24	0.03	-	-	-	-	-	-	-	-	-	-	-	-
1.0	0.77	0.44	0.11	0.02	-	-	-	-	-	-	-	-	-	-	-
1.5	0.51	0.56	0.23	0.06	0.01	-	-	-	-	-	-	-	-	-	-
2.0	0.22	0.58	0.35	0.13	0.03	-	-	-	-	-	-	-	-	-	-
2.5	-0.26	0.34	0.49	0.31	0.13	0.04	0.01	-	-	-	-	-	-	-	-
4.0	-0.1	-0.07	0.36	0.43	0.28	0.13	0.05	0.02	-	-	-	-	-	-	-
5.0	-0.18	-0.38	0.05	0.36	0.39	0.26	0.13	0.05	0.02	-	-	-	-	-	-
6.0	0.15	-0.28	-0.24	0.11	0.36	0.36	0.25	0.13	0.06	0.02	-	-	-	-	-
7.0	0.3	0.00	-0.30	-0.17	0.16	0.35	0.34	0.23	0.13	0.06	0.02	-	-	-	-
8.0	0.17	0.23	-0.11	-0.29	-0.10	0.19	0.34	0.32	0.22	0.13	0.06	0.03	-	-	-
9.0	-0.09	0.24	0.14	-0.18	-0.27	0.06	0.20	0.33	0.30	0.21	0.12	0.06	0.03	0.01	-
10.0	-0.25	0.04	-0.25	0.06	-0.22	-0.23	-0.01	0.22	0.31	0.29	0.20	0.12	0.07	0.03	0.01
12.0	0.05	-0.22	-0.08	0.20	0.18	-0.07	0.24	-0.17	0.05	0.23	0.30	0.27	0.20	0.12	0.01
15.0	-0.01	0.21	0.04	-0.19	-0.12	0.13	0.21	-0.17	-0.22	-0.09	0.10	0.24	0.28	0.25	0.01

↳ This is the value of  $J_1(15)$

