أسئلة مادة :

إتصالات 1

الفصل الرابع
اتصالات

هذا العمل من إعداد
اتحاد طلبة كلية التقنية الإلكترونية - طربلس
بالتعاون مع قسم الشؤون العلمية والتقنية بالكلية

أسئلة امتحان مادة اتصالات 1

(نصفي 2 + 1)

2010 – 2009 – 2008 – 2007 – 2006 – 2005 -
2004

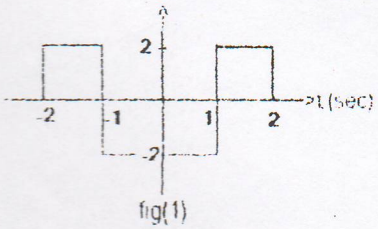
أساتذة :

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفى ربيع 2010 ف الزمن : ساعة ونصف

المادة: مبادى اتصالات 1

Q1 a:-Find Fourier transform of the signal shown in fig (1)



fig(1)

b- Determine the transforms of the following

i- $\delta(t)$ **ii-** $\delta(t-2)$ **iii-** $u(t)$ **iv-** $\cos^2 20t$ **v-**$x(at)$

Q2-a-If the modulated signal is

$s(t)= 1.2 \cos 2\pi\, 400t+3 \cos 2\pi 500\, t +1.2 \cos 2\pi 600\, t$

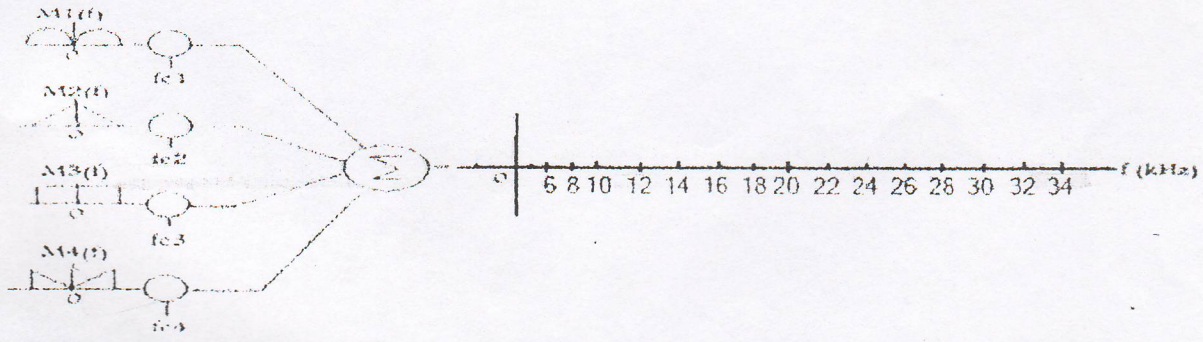
what is

a) carrier signal (c(t))
b) message signal (m(t))
c) power in carrier signal
d) power in sidebands
e) efficiency (η)

b:- Show that an AM signal can be generated by Non linear element modulator (square law modulator).

Q3-a- Explain brevity vestigial sideband modulation (VSB), for example generation, bandwidth and advantage.

b- Four signal each has 4kHz bandwidth are to be multiplexed using FDM shown below, draw the spectrum of the signals if the carrier signals **fc_1=24kHz, fc_2=12kHz, fc_3=30kHz and fc_4=18kHz** and the type of modulation is LSSB



Notes

$\sin(x+y)=\sin(x).\cos(y) + \cos(x).\sin(y)$

$\cos(x+y)= \cos(x).\cos(y) - \sin(x).\sin(y)$

$\cos(x).\cos(y)= \frac{1}{2}[\cos(x-y) + \cos(x+y)]$

$\sin(x).\sin(y)= \frac{1}{2}[\cos(x-y) - \cos(x+y)]$

$\cos(\theta)= \frac{1}{2}\,[\exp(j\theta) + \exp(-j\theta)]$

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفي خريف 2009 إفرنجى المادة: مبادئ اتصالات1 الزمن : ساعة ونصف

Q1-a: if the Fourier transform of f (t) is $F(w) = \frac{5}{(1+jw)(2+jw)}$

Determine the transforms of the following

i-f(-3t) ii- f(2t-1)

b: find the Fourier transforms of the sinusoidal-wave shown in figure (1)

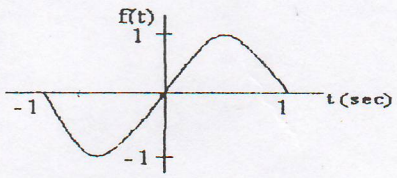
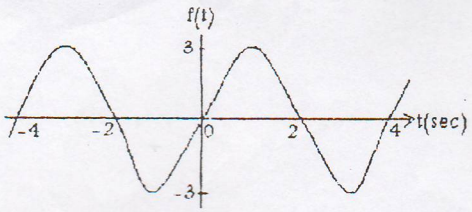


figure (1)



Q2-what is the

1-type of modulation 2-P_T 3- P_{SB} 4- BW of the signal

5- Sketch the spectrum of signal

a: if the modulated signal is

s(t)= 0.7cos (2π 200 t). cos (2π 10 t) +0.5 cos 2π 200 t

b: if the modulated signal is

s(t)= 0.7 cos (2π 120 t) +0.7 cos (2π 80 t)

c: **if the modulated signal is**

s(t)=0.8 cos (2π 120 t)

Q3) a- Draw the block diagram of an AM, DSB-SC and SSB-SC transmitters.

b: sketch the spectrum at the points 1,2 and 3 shown in figure (2). If the amplitude spectrum of m(t) shown in figure (3)

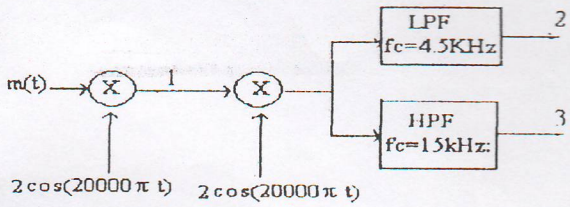
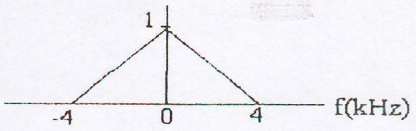


figure (2)



figure(3)

Notes

sin(x+y)=sin(x). cos(y) + cos(x). sin(y)

cos(x+y)= cos(x).cos(y) - sin(x).sin(y)

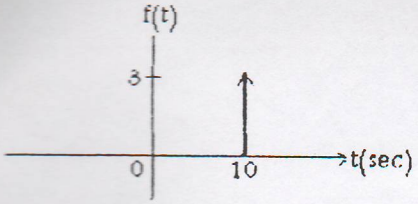
cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]

sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]

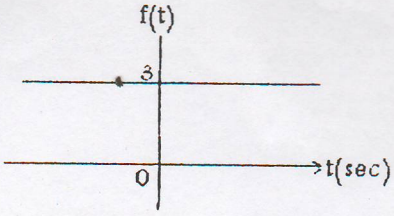
المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفي خريف 9- 2008 إفرنجي المادة: مبادئ اتصالات1 الزمن : ساعة ونصف

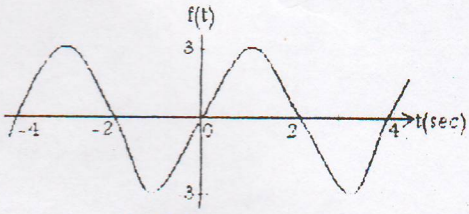
Q1- a:-Find the Fourier Transform of the signals f(t) shown in figure below



fig(1)



fig(2)



fig(3)

b-What is the advantage and disadvantage of AM, DSB and SSB modulation.

Q2-If the message signal is m(t)= 2 cos(2π 10t) +2 cos(2π 20t) modulated by the carrier signal C (t) = 4 cos 2π 100 t

a- If the type of modulation is AM, find

1- s(t)

2-P_t

2- P_{SB}

3- Efficiency (η)

4- BW of AM signal

5- Sketch the spectrum of signal if it passed in the HPF with cutoff frequency (f_{cut}=90 Hz) before transmission

b- If the type of modulation is LSSB-SC, find

1- s(t)

2- P_t

3- BW of modulated signal

4- Efficiency (η)

5- Sketch the spectrum of signal if it passed in the LPF with cutoff frequency (f_{cut} 110 Hz) before transmission

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III-a- Show that DSB signal can be demodulated by synchronies detector

b- Four signal each has **4kHz** are to be multiplexed with **1kHz** guard band between channels before modulation, the sub-carrier is **AM** except for the lowest channel which is un-modulated, and the carrier modulation is also **AM**. Sketch the spectrum of the base band signal and transmitted signal and calculate the transmission bandwidth

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Notes

sin(x+y)=sin(x). cos(y) + cos(x). sin(y)

cos(x+y)= cos(x).cos(y) - sin(x).sin(y)

cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]

sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]

sin(x).cos(y)= ½[sin(x-y) - sin(x+y)]

cos(0)= ½ [exp(j0) + exp(-j0)]

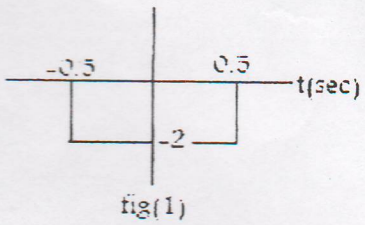
المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفي ربيع 2008 إفرنجى المادة: مبادئ اتصالات1 الزمن : ساعة

I- a:-Find the Fourier transform of the signal in fig (1)

b: Determine the transforms of x(t) where

$x(t) = 4\cos^2 2\pi 10t$



fig(1)

II- If the message signal is $m(t) = 4\cos^2 2\pi 10t$

And carrier signal is C (t) = 6 cos 2π 100 t

a- If the type of modulation is AM, find

1-Sketch the spectrum of m (t) signal

2- Sketch the spectrum of AM signal

3- Pc

4- P_{SB}

5- Efficiency (η)

b- If the type of modulation is DSB-SC, find

1- S (f)

2- P_t

3- P_{usb}

III- Show that SSB signal can be demodulated by synchronies detector

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Notes

sin(x+y)=sin(x). cos(y) + cos(x). sin(y)
cos(x+y)= cos(x).cos(y) - sin(x).sin(y)
cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]
sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]
sin(x).cos(y)= ½[sin(x-y) - sin(x+y)]
cos(θ)= ½ [exp(jθ) + exp(-jθ)]

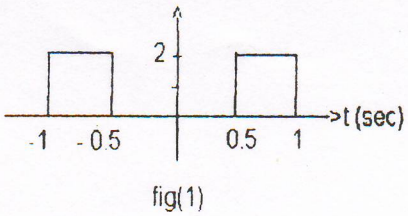
المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفي ربيع 2007 إفرنجى المادة: مبادئ اتصالات1 الزمن : ساعة ونصف

I- a:-find the Fourier transform of the signal in fig (1)

b: Determine the transforms of x(t) where

$x(t) = \cos 2\pi 10t.e^{-j2\pi 50t}$



fig(1)

II- If the message signal is m (t) = cos2π10t + 2 cos2π20t + 3cos2π30t

And carrier signal is C (t) = 3 cos 2π 100 t

a- If the type of modulation is AM, find

1- Sketch the spectrum of AM signal

2- Pc

3- P_{SB}

4- Modulation index (μ)

5- Efficiency (η)

b- If the type of modulation is DSB-SC, find

1- S (f)

2- P_{usb}

3- P_t

c- If the type of modulation is USSB-SC, find

1- s(t)

2- Sketch the spectrum

III- a- Show that an AM signal can be generated by Non linear element modulator (square law modulator)

b: Show that SSB signal can be demodulated by synchronies detector

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Notes

sin(x+y)=sin(x). cos(y) + cos(x). sin(y)
cos(x+y)= cos(x).cos(y) - sin(x).sin(y)
cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]
sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]
cos(θ)= ½ [exp(jθ) + exp(-jθ)]

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفى الاول ربيع 2006 ف الزمن : ساعة ونصف

المادة: مبادى اتصالات1

Q1- If the message signal is m (t) = cos 2π 10k t and carrier signal is C (t) = 1.5 cos 2π 50k t

I- If the type of modulation is AM, find

1- s(t)
2- S(f)
3- Sketch the spectrum
4- Pc
5- P_{usb}
6-P_t
7- Efficiency (η)

II- If the type of modulation is DSB-SC, find

1- s (t)
2- S (f)
3- Sketch the spectrum
4- P_{usb}
5- P_t
6- Efficiency (η)

III- If the type of modulation is USSB-SC, find

1- s(t)
2- S(f)
3- P_{usb}

Q2- a- Show that an AM signal can be generated by Non linear element modulator (square law modulator)

b- Show that DSB-SC signal can be generated by balanced modulator

c- Show that SSB-SC signal can be generated by phase shift modulator

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Notes

sin(x+y)=sin(x). cos(y) + cos(x). sin(y)
cos(x+y)= cos(x).cos(y) - sin(x).sin(y)
cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]
sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]
cos(θ)= ½ [exp(jθ) + exp(-jθ)]

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفى خريف 2006 ف المادة: مبادى اتصالات1 الزمن : ساعة ونصف

Q1- a: find the Fourier transforms of f(t) where

1- $f(t) = u(t+\tau/2) - u(t-\tau/2)$

2- $f(t) = u(t).\ e^{j2}$

3- $f(t) = 2\ e^{j2}$

4- $f(t) = 10 \sin(2\pi\ 10)t$

5- $f(t) = d\ u(t)/dt$

Q2:I- an AM transmitter is modulated with an audio testing signal by

$m(t) = 2 + 4 \cos \omega_1 t$ and $c(t) = Ac \cos \omega_c t$

where $f_1 = 50Hz$, $f_c = 1$ kHz and $Ac = 10$

a) Sketch the spectrum of the AM waveform about fc

b) Evaluate the average power of the carrier signal

c) Evaluate the average power of the m(t) signal

d) If the power of carrier is 10 W and the power of USB is 2W what is the efficiency (η) of this modulation

II- Single side band signal $S(t) = 2 \cos w_1 . \cos w_2 - 2 \sin w_1 . \sin w_2$,

Prof that s(t) has one side band

Q3 : Four signal each has BW= 10 kHz, are to be multiplexed with 2-KHz guard bands between channels before modulation. The sub-carrier modulation is LSSB_SC, except for the lowest channel which is unmodulated, and the carrier modulation is AM. Sketch the spectrum of the base-band signal and transmitted signal and calculate the transmission bandwidth.

Note :

$\sin(x+y) = \sin(x).\cos(y) + \cos(x).\sin(y)$

$\cos(x+y) = \cos(x).\cos(y) - \sin(x).\sin(y)$

$\cos(x).\cos(y) = \frac{1}{2}[\cos(x-y) + \cos(x+y)]$

$\sin(x).\sin(y) = \frac{1}{2}[\cos(x-y) - \cos(x+y)]$

$\cos(\theta) = \frac{1}{2}[\exp(j\theta) + \exp(-j\theta)]$

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفى الثانى ربيع 2006 ف الزمن : ساعة

المادة: مبادى اتصالات1

Q- frequency modulated signal has total power 8 W which is modulated by sinusoidal signal 2KHz reaches a maximum frequency of 96.004 MHz and minimum frequency of 95.996 MHz and frequency sensitivity k_{fm} =2000 Hz/volt .

Find:

1- The modulation index?

2- The carrier swing.

3- m (t)

4- S_{FM} (t)

5- The maximum frequency deviation of the signal.

6- The power present at the carrier frequency?

7- The power present at bandwidth 7 KHz

Notes

$\sin(x+y)=\sin(x).\cos(y) + \cos(x).\sin(y)$

$\cos(x+y)= \cos(x).\cos(y) - \sin(x).\sin(y)$

$\cos(x).\cos(y)= ½[\cos(x-y) + \cos(x+y)]$

$\sin(x).\sin(y)= ½[\cos(x-y) - \cos(x+y)]$

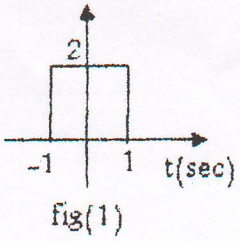
$\cos(\theta)= ½ [\exp(j\theta) + \exp(-j\theta)]$

مع تمنياتنا للجميع بالتوفق/ اساتذة المادة

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفي ربيع 2005 إفرنجى المادة: مبادئ اتصالات1 الزمن : ساعة ونصف

Q1- a:-find the Fourier transform of the signal in fig (1)



fig(1)

b: Determine the transforms of the following

i- $\delta(t)$ **ii-** $\delta(t-2)$ **iii-** $u(t)$ **iv-** $g(t) = e^{at}u(t)$

Q2) i- Draw the block diagram of an AM, DSB-SC and SSB-SC transmitters.

ii- The signal $m(t) = \cos(\pi 200t)\cos(\pi 300t)$ is modulated by the carrier $c(t) = \cos(\pi 1000t)$ using DSB-SC modulation.

a) Plot the spectrum of $m(t), c(t)$ and $s(t) = m(t) \cdot c(t)$ in three separate graphics

b) Mark on the drawing the upper side band frequencies of $s(t)$. Find the mathematical expression.

c) Mark on the drawing the lower side band frequencies of $s(t)$. Find the mathematical expression.

Q3-i- A DSB-FC (AM) tone modulation transmission uses a modulation index of 0.85. Calculate the efficiency of the transmission (**η**)

ii- If the signal x (t) = 2cos (400πt) +3cos (800πt)

Is used to modulate the carrier signal

C (t) = 5 cos (20000πt)

Using SSB, What will be the equation of the USB modulated signal?

Notes

sin(x+y)=sin(x). cos(y) + cos(x). sin(y)

cos(x+y)= cos(x).cos(y) - sin(x).sin(y)

cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]

sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]

cos(θ)= ½ [exp(jθ) + exp(-jθ)]

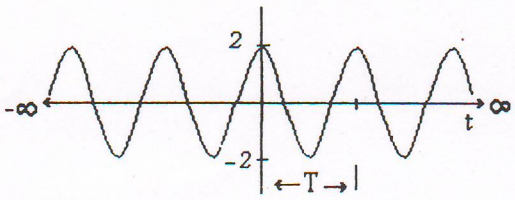
المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفى الاول خريف 2005 ف الزمن : ساعة ونصف

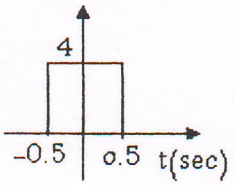
المادة: مبادى اتصالات1

Q1-a: find the Fourier transforms of the sinusoidal-wave pulse shown in figure (1) where T= 1 μ sec

b: find the Fourier transform of the signal in fig (2)



fig(1)



fig(2)

Q1- In the AM signal if the message m(t) = cos 2π10 t and carrier c(t)= 2 cos 2 π100 t

a: find **i)** P_c **ii)** P_{sb} **iiii)** P_t **IV)** efficincy (η)

b: If the system changed to the DSB system

find **i)** P_c **ii)** P_{sb} **iiii)** P_t **IV)** efficiency (η)

c: If the system changed to the DSB system

find **i)** P_c **ii)** P_{sb} **iiii)** P_t **IV)** efficiency (η)

Q3-a: Draw the block diagram of an AM, DSB-SC and SSB-SC transmitters.

b: Show that SSB signal can be demodulated by synchronies detector

---

Notes

$sin(x+y)=sin(x).\ cos(y) + cos(x).\ sin(y)$

$cos(x+y)= cos(x).cos(y) - sin(x).sin(y)$

$cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]$

$sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]$

$cos(θ)= ½ [exp(jθ) + exp(-jθ)]$

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفى الاول خريف 2004 ف　　الزمن : ساعة ونصف

المادة: مبادى اتصالات1

Q1-a: what is the advantages and disadvantages of AM and DSB signal

b: In the AM signal if the message $m(t) = 500 \cos 2\pi 1000\, t$ and carrier $c(t) = 700 \cos 2\pi 130000\, t$

find i) modulation index (μ)　ii) P_c　iii) P_{usb}　iv) P_t

Q2-If the modulated signal is

$s(t) = 0.6 \cos 16500\pi\, t + 3 \cos 20000\pi\, t + 0.6 \cos 23500\pi\, t$

what is

a) modulated carrier c(t)
b) message signal m(t)
c) modulation index

Q3) a:- Show that an AM signal can be generated by Non linear element modulator (square law modulator) of figure (1)

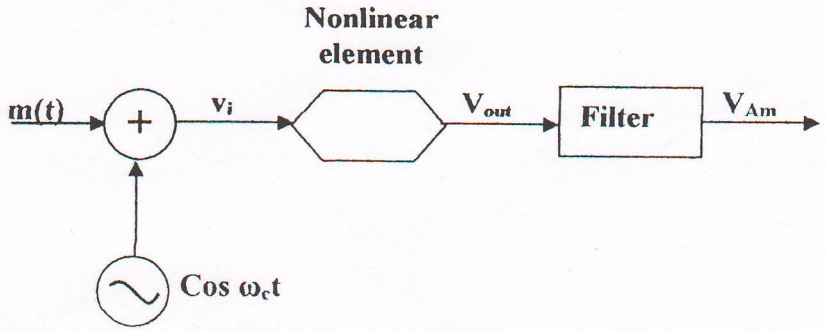
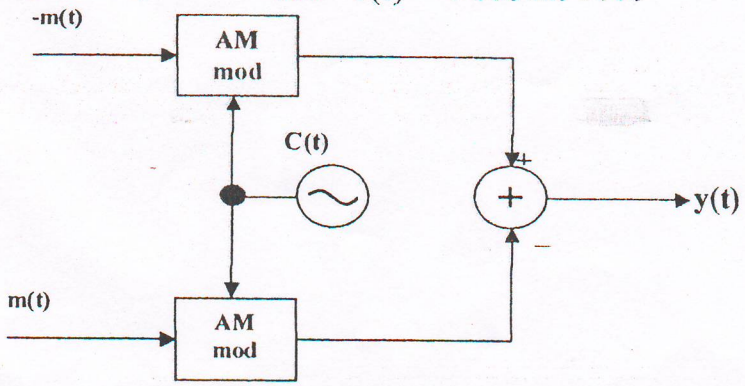


Fig (1)

b: In the figure shown below find y(t) and Y(w) if

$m(t) = e^{j2\pi 10t} + e^{-j2\pi 10t}$　and　$c(t) = 4 \cos 2\pi\, 100t$



Notes

$\sin(x+y) = \sin(x).\cos(y) + \cos(x).\sin(y)$

$\cos(x+y) = \cos(x).\cos(y) - \sin(x).\sin(y)$

$\cos(x).\cos(y) = \frac{1}{2}[\cos(x-y) + \cos(x+y)]$

$\sin(x).\sin(y) = \frac{1}{2}[\cos(x-y) - \cos(x+y)]$

$\cos(\theta) = \frac{1}{2}[\exp(j\theta) + \exp(-j\theta)]$

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النصفى الثانى خريف 2004 ف الزمن : ساعة

المادة: مبادى اتصالات1

Q1-: If the single tone modulating signal m (t) = 500 cos 2π1000 t and the carrier c (t) = 700 cos 2 π 20000 t are the input of the phase-shift modulator and the output is the upper-sideband SSB signal.

i) find The output of the modulator {s(t)}

ii) What is the S(ω) and sketch it.

iii) What is the P_T

Q2- A frequency modulated signal which is modulated by a 3-kHz tone wave reaches a maximum frequency of 100.02 MHz and minimum frequency of 99.98 MHz

a) Determine the carrier swing.

b) Find the carrier frequency.

c) Calculate the frequency deviation of the signal.

d) What is the modulation index of the signal

e) If the modulated signal was the PM signal, what is the modulation index of the signal?

Notes

$\sin(x+y)=\sin(x).\cos(y) + \cos(x).\sin(y)$

$\cos(x+y)= \cos(x).\cos(y) - \sin(x).\sin(y)$

$\cos(x).\cos(y)= ½[\cos(x-y) + \cos(x+y)]$

$\sin(x).\sin(y)= ½[\cos(x-y) - \cos(x+y)]$

$\cos(\theta)= ½ [\exp(j\theta) + \exp(-j\theta)]$

مع تمنياتنا للجميع بالتوفق/ اساتذة المادة

أسئلة امتحان مادة اتصالات 1

(نهائي)

ربيع - 2014, 2015

2012 – 2011 – 2010 – 2009 – 2007 – 2005 –
2004 – 2003

أساتذة :

د – نبيل ابوجناح

د – محمد عبدالله سعيد

College of Electronic Technology-Tripoli

Communication systems

Q.1) Numerate natural phenomena affecting radio wave propagation. Explain any one you think it affects more the HF radio propagation.

Q.2) In HF communication how is the maximum usable frequency (MUF) related to the critical frequency?

Q.3) FOT is a good choice for HF communication, but not always, why?

Q.4) Indicate types of repeaters in use for LOS communication. Draw a block diagram of one type giving names of all blocks.

Q.5) Define reliability due to equipment and state if any a trade off to improve reliability.

Q.6) Why should clearance be provided when designing a radio link? And explain for each clearance reasons behind it.

Q.7) What is multipath fading?. Explain how to minimize fading in LOS microwave system.

Q.8) In a certain telemetry system, there are four analogue signals $m_1(t)$, $m_2(t)$, $m_3(t)$, and $m_4(t)$. The bandwidth of $m_1(t)$ is 3.6 kHz, but those of the remaining signals are 1.4 kHz each. These signals are to be sampled at rates no less than their respective Nyquest rate, and are to be word by word multiplexed (PCM – TDM). Suggest a suitable multiplexing scheme for this purpose. What is the commutator frequency (in rotations per second)?.

Q.9) In LOS communications calculate the minimum tower heights for two sites at altitudes of 430 and 450 m above MSL and separated by 55 km when a 2.5 GHz signal is transmitted through a path of trees and two major obstacles at altitudes of 440 m and 420 m and distances of 15 and 30 km from one site. Assume k =4/3 (sketch profile).

Q.10) What is the difference between SDH and PDH?. Explain advantages and disadvantages of each.

Q3- An angle modulation signal with $\omega_C = 2\pi \times 10^5$ is described by the eqation:

$$s(t) = 10\cos[\omega_C t + 5\sin(3000t) + 10\sin(2000\pi t)]$$

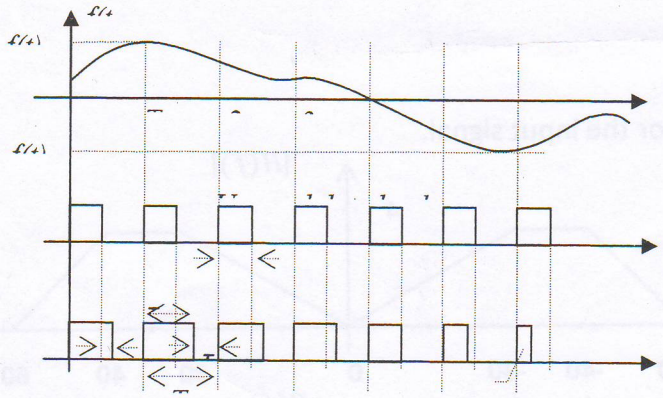
a. Find the power of the modulated signal.
b. Find the frequency deviation Δf
c. Find the deviation ratio β

Q4-

a. ما نوع التضمين المستخدم اذا كان التردد اللحظي يتغير خطيا مع تفاضل اشارة المعلومات.
b. ادكر نوع التضمين في كل من الحالات التالية:

1. $s_1(t) = A_C[1 + m(t)]\cos(2\pi f_C t)$
2. $s_2(t) = A_C m_1(t)\cos(2\pi f_C t) + A_C m_2(t)\sin(2\pi f_C t)$
3. $s_3(t) = A_C m(t)\cos(2\pi f_C t) \mp A_C \hat{m}(t)\sin(2\pi f_C t)$

c. ادكر المصطلح العلمي لإرسال عدة قنوات بنفس التردد في أزمنة مختلفة.
d. عرف/ادكر (Nyquist rate)
e. بماذا يتميز نظام التضمين VSB
f. ما هو شرط استخدام (Envelope Detector) لاستخلاص اشارة المعلومات.
g. ما المقصود بـــ coherent detection
h. ادكر نوع التضمين المستخدم في الشكل التالي.



تمنياتي للجميع بالتوفيق

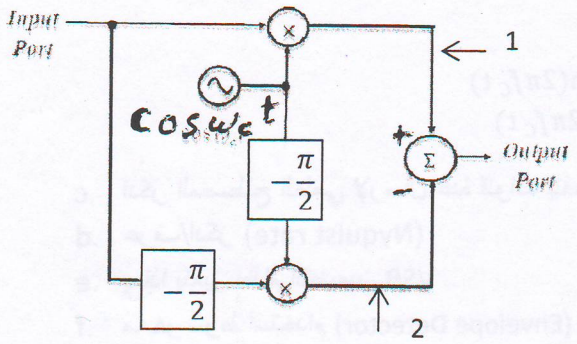
$$\cos\theta\cos\varphi = \frac{1}{2}[\cos(\theta-\varphi) + \cos(\theta+\varphi)]$$

$$\sin\vartheta\cos\varphi = \frac{1}{2}[\sin(\theta-\varphi) + \sin(\theta+\varphi)]$$

$$\sin\theta\sin\varphi = \frac{1}{2}[\cos(\theta-\varphi) - \cos(\theta+\varphi)]$$

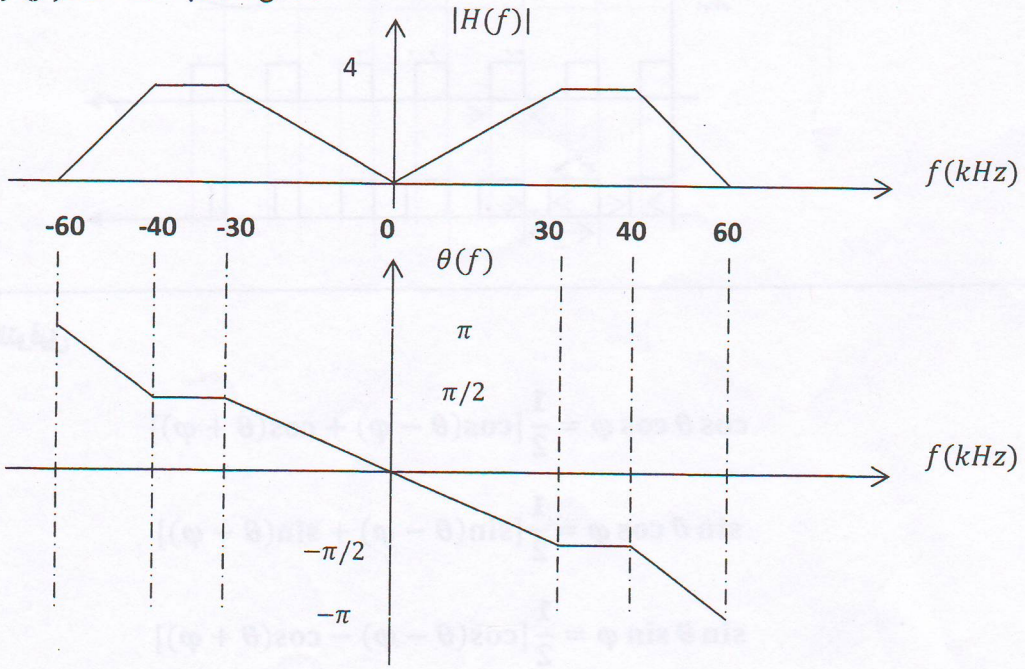
Q1- Consider the following circuit: A single-sideband (SSB) can be generated by feeding amessage signal$m(t) = \sin(\omega_m t + \frac{\pi}{2})$ into the input port of the shown circuit.

a- Write the expression of the signal at 1 and 2
b- Determine the modulated signal *s(t)* at the output port.
c- What is the transmitted sideband?
d- What should be the value of the carrier frequency ω_c?



Q2- A channel has frequency characteristics as shown below. The following signal was applied to the channel

Draw the output $y(f)$for the input signal.



كلية التقنية الالكترونية- طرابلس
قسم هندسة الاتصالات
د. محمد عبدالله سعيد

المادة: الاتصالات اللاسلكية
الامتحان النهائي ربيع 2015
الزمن: ساعتان

أجب عن جميع الأسئلة

السؤال الأول: (10 درجات)

ضع علامة صح او خطأ امام العبارات الأتية:

1 ـ الخلية هي أكبر مساحة جغرافية يمكن أن يغطيها أي نظام هاتف محمول.
2 ـ كلما زاد معامل نشر البيانات كلما زادت نسبة خطأ البيانات في نظام CDMA.
3 ـ إذا كان عرض نطاق الإشارة المرسلة أصغر من عرض النطاق المترابط للقناة فإن الإشارة المستقبلة تمر عبر تلاشي مسطح.
4 ـ يمكن زيادة السعة بإعادة استخدام الترددات في الخلايا المجاورة.
5 ـ الشكل الدائري هو الشكل المثالي لخلايا نظم الهاتف المحول.

السؤال الثاني: (10 درجات)

أ) ماهي الرؤيا والتحديات في نظم الاتصالات اللاسلكية (المحمولة)؟ **(5 درجات)**
ب) وضح كل من التعدد في مجال التردد والتعدد في مجال الزمن؟ **(5 درجات)**

السؤال الثالث: (10 درجات)

إذا كان كل خلية في عنقود لها الاحداثيات المعطاة، أوجد قيم N , Q, S/I(dB) في الجدول التالي اذا كانت قيمة $v=4$؟

i	j	N	Q	S/I(dB)
1	1			
2	1			
2	2			
3	2			

السؤال الرابع: (10 درجات)

أ) ما الفرق بين التلاشي البطيء والتلاشي السريع؟ **(4 درجات)**
ب) أوجد قيمة تردد دوبلر يحدث لهاتف نقال في مركبة تسير بسرعة 45 كم/ الساعة إذا كانت زاوية سقوط الإشارة 45^0 وتردد الإشارة 1.8 جيجا هيرتز علما بأن سرعة الضوء $3*10^8$؟

بقية الأسئلة في الخلف

السؤال الخامس: (10 درجات)

إذا كان لدينا نظام اتصالات لاسلكيةTDMA يغطي مساحة 2100كم مربع وكل عنقود فيه يتكون من 7 خلايا و مساحة كل خلية 50كم مربع تستخدم هوائي أحادي الاتجاه وكانت قيمة سير البيانات المعروضة A=21.493 Erl واحتمالية الرفض P(B)=0.02 وعرض نطاق القناة 800kHz وعرض نطاق النظام 21MHz ومتوسط عدد المكالمات 3 مكالمات في الساعة وزمن كل مكالمة 5 دقائق.

أ) أوجد اقصى عدد للمستخدمين في المساحة الكلية؟ **(7 درجات)**

ب) أوجد شدة العبور (كفاءة الاتصال) في هذا النظام؟ **(3 درجات)**

السؤال السادس: (10 درجات)

أ) أذكر الطرق الممكنة لزيادة السعة في نظم الاتصالات اللاسلكية المحمولة؟ **(4 درجات)**

ب) نظام IS-95 uplink cdma يستخدم كود غير متعامد فيه نسبة عرض نطاق نشر البيانات الى عرض نطاق الاشارة هو 64، وعرض النطاق للقناة هو 12.5 ميغا هيرتز و نسبة الاشارة الى التداخل 6dB.

أ) أوجد العدد الكلي للمستخدمين في هذا النظام؟

ب) كم يكون عدد المستخدمين اذا تم استخدام نظام FDMA بنفس عرض النطاق الكلي ؟

مع تمنياتي للجميع بالتوفيق

كلية التقنية الألكترونية طرابلس
قسم هندسة الأتصالات

التاريخ : 2015-01-21 م
الزمن :11:30 –09:00

الأمتحان النهائي (خريف 2014-2015) مادة أتصـــــــــــــــالات 1

(ملاحظة: يمنع منعاً باتاً أستخدام الهاتف النقال والحاسبات المبرمجة)

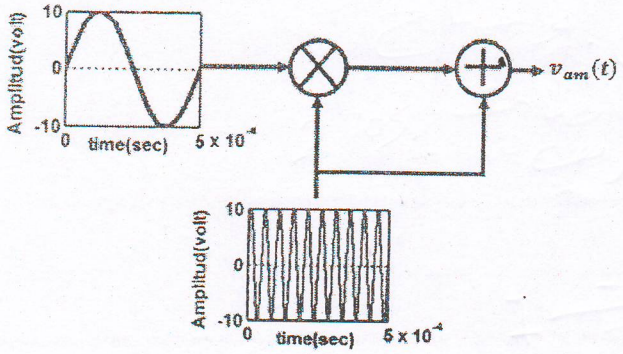
السؤال الأول (10 درجات- 25%):

من الشكل رقم (1):

(أ) أحسب كلاً من أتساع أشارة المعلومات و أتساع الأشارة الحاملة وتردد كلاًمنهما وكذلك معامل التضمين. (3 درجات)

(ب)أكتب تعبيراً رياضياً لكلاً من أشارة المعلومات والأشارة الحاملة معتمداً علي قيم الأتساع والتردد المحسوبة من الفقرة أ. (3 درجات)

(ج) أرسم شكلاً للأشارة المضمنة الناتجة. (4 درجات)



شكل (1)

السؤال الثاني (10 درجة- 25%):

للدائرة المبينة في الشكل رقم (2):

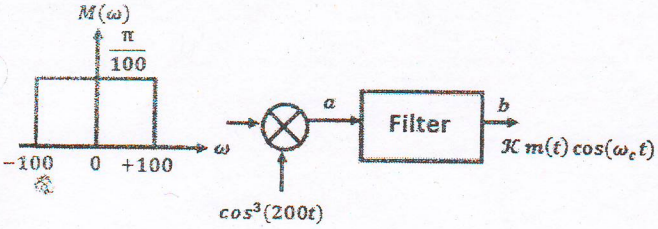
(أ) وضح فيما أذا كان من الممكن توليد أشارة تضمين $\mathcal{K}\, m(t)\cos(\omega_c t)$ علماً بأن مولد الأشارة الحاملة يولد اشارة $\cos^3 \omega_c t$. (2 درجة)

(ب) مانوع المرشح المطلوب في الدائرة ولماذا.(2 درجة)

(ج) أوجد طيف الأشارة عند النقاط a, b وحدد النطاق الترددي الموجود بهذة الأطياف.(2 درجة)

(د) هل هذة الدائرة تعمل عندما تكون $v_c(t) = \cos^2 \omega_c t$ وضح ذلك.(2 درجة)

(ج) هل الدائرة تعمل اذا كان عندما تكون $v_c(t) = \cos^n \omega_c t$ لأي $n \geq 2$ (2 درجة)

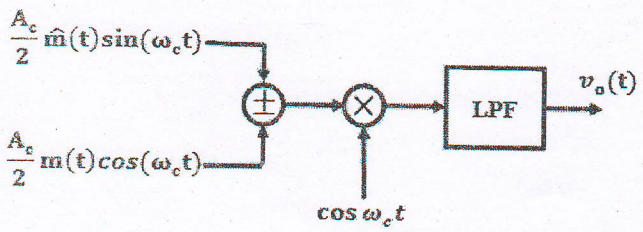


شكل (2)

السؤال الثالث (10 درجة- 25%):

(أ) بث أذاعي لمحطة AM تعمل عند معامل تضمين مساوي لـ 95%، أحسب النسبة المئوية لقدرة الأرسال الكلية الموجودة في الأنطقة الجانبية. (5 درجات)

(ب) في الشكل رقم (3) أوجد $v_o(t)$ (5 درجات)



شكل (3)

السؤال الرابع (10 درجة- 25%):

أشارة معلومات معطاة بـ $v_m(t) = 2\sin(30 \times 10^3 \pi t)$ ضُمنت ترددياً بواسطة أشارة حامله معطاة بالعلاقة $v_c(t) = 10\sin(200 \times 10^6 \pi t)$ أذا كانت حساسية التردد تساوي 25 كيلوهيرتز أحسب:

(أ) تأرجح تردد الأ شارة الحاملة (4 درجات)

(ب) معامل التضمين (3 درجات)

(ج) نسبة التضمين (3 درجات)

$$F_D = \begin{cases} 75\ kH_z & (FM\ radio\ 88-108\ MH_z) \\ 25\ kH_z & TV\ sound\ broadcast \\ 05\ kH_z & 2-way\ mobile\ radio\ (25kH_z\ Bw) \\ 2.5\ kH_z & 2-way\ mobile\ radio\ (12.5kH_z\ Bw) \end{cases}$$

مع أطيب الأمنيات

د.نبيل عبدالجليل أبوجناح

College of Electronic Technology-Tripoli

Communication systems

Q.1) Why is F2 region mainly responsible for the longest distance radio propagation?

Q.2) What does the term "critical angle" mean as used in radio wave propagation?

Q.3) Why is long distance communication on the 40, 60, 80 and 160 meter bands more difficult during the day?

Q.4) What factors affect Maximum Usable Frequency MUF in HF radio system?

Q.5) Explain briefly the design requirements of HF antennas.

Q.6) Why should clearance be provided when designing a radio link? And explain for each clearance reasons behind it.

Q.7) What is the difference between SHD and PHD?

Q.8) Explain the Diversity system in radio microwave link.

Q.9) Explain briefly the following:

Framing, Pulse stuffing, Noise temperature, Fading in HF radio system and LOS microwave system and how to minimize Fading problem in each system?

Q.10) Four analog band-limited signals $m_1(t)$, $m_2(t)$, $m_3(t)$ and $m_4(t)$ with bandwidths 1200Hz, 700Hz, 300Hz, and 200 Hz respectively. These signals are to be sampled at rates no less than their respective Nyquest rates and PCM-TDM multiplexed. Suggest a suitable multiplexing scheme. What is the commutator frequency (in rotations per second)."*Hint: first multiplex m2, m3, and m4 and then multiplex this composite signal with* m_1*)*".

Q.11) In LOS communications calculate the minimum tower heights for two sites at altitudes of 400 and 420 m above MSL and separated by 45 km when a 3GHz signal is transmitted through a path of trees and two major obstacles at altitudes of 450 m and 430 m and distances of 10 and 25 km from one site. Assume k =4/3 (sketch profile).

I cyber
وليد الطامر

كلية التقنية الألكترونية – بن عاشور

Electrical and Electronic Engineering Department

Subject: Communication Engineering I Date: ….. – 5 - 2014

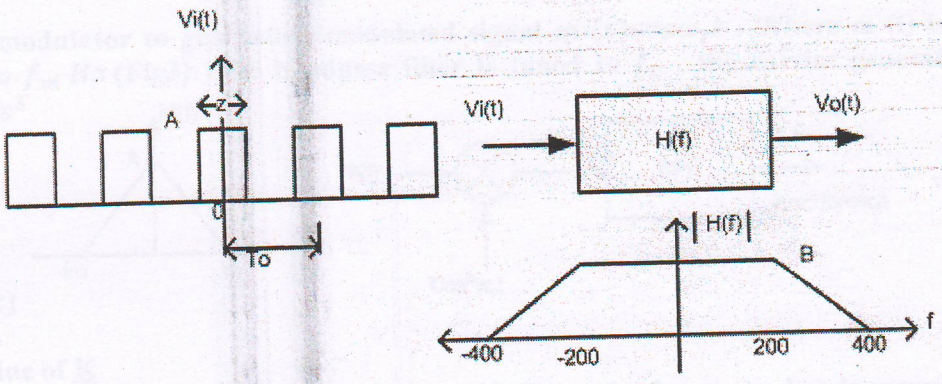
FALL 2013 **Final exam** **Time: 3 Hours**

Problem (1)

An input signal, $v_i(t)$, whose Fourier series is given by, $v_i(t) = \frac{A\tau}{T_o}\sum_{n=-\infty}^{\infty} \frac{\sin(\frac{n\pi\tau}{T_o})}{(\frac{n\pi\tau}{T_o})} e^{\frac{j2\pi nt}{T_o}}$, is applied to a filter transfer function $|H(F)|$ is as shown in (Fig 1.)

If A=10 , $\frac{\tau}{T_o} = \frac{1}{2}$, $and\ T_o = 0.01\ sec.$

i) Draw two sided amplitude line spectrum of the output signal.
ii) Find the power spectral density of the input and output signal.
iii) Find $\underline{B}$ such that the 3rd harmonic component of the output is attenuated by 10 times.



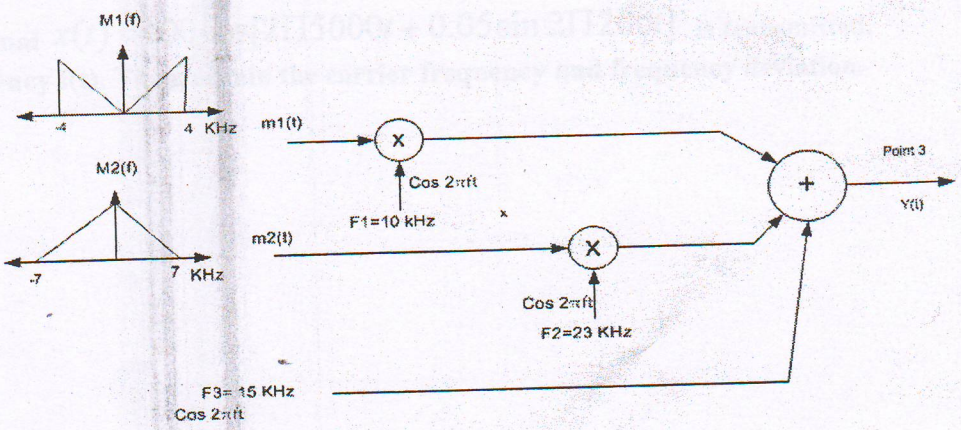
(Fig. 1)

Problem (2)

a) Why is a high-frequency carrier needed in a communication system?

b) Define essential bandwidth

c) For the system shown in (*Fig2*). Draw the amplitude spectrum at point 3 and what is the required transmission bandwidth.



(Fig.2)

Problem (3)

a) what does a Fourier transform do

b) A waveform $x(t)$ is given by

$$x(t) = 2\cos(200\pi t) - 0.5\cos(600\pi t + 45) + 0.5\,Sin\,(800\pi t)$$

i) Sketch carefully its frequency spectral $X(f)$.

ii) Signal $x(t)$ is applied to the input of an ideal low pass filter with $BW = 4000Hz$ find the output of the filter .

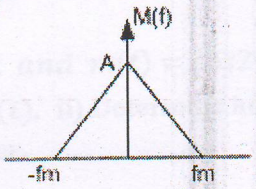
Problem (4)

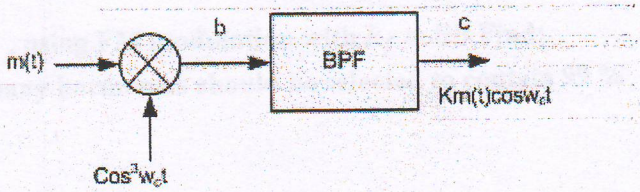
a) An AM transmitter radiates 9Kw when the carrier is unmodulated, and 10.125Kw. when the carrier is sinusoidal modulated.

i) find modulation index percentage of modulated.
ii) If another sine wave corresponding to 40 percent modulation is transmitted simultaneously. Calculate the total radiation power.

b) Design a DSB-SC modulator to generate a modulated signal m $(t)cos\omega_c t$. Where m (t) is a signal band limited to $f_m\,Hz$ (Fig3). The bandpass filter is tuned to f_c . the carrier generator available generates cos^3

fig.(3)





$\cos^3 x = \frac{1}{4}(3\cos x + \cos 3x)$

i) what is the value of K
ii) Determine the signal spectra at point's b and c, and indicate the frequency bands occupied by these spectra.
iii) What is the minimum usable value of f_c ?

Problem (5)

a) 1. The narrowband FM signal $x(t) = 100\cos[2\Pi 5000t + 0.05\sin 2\Pi 200t]$ is transmitted. Find the instantaneous frequency f(t). Then, obtain the carrier frequency and frequency deviation.

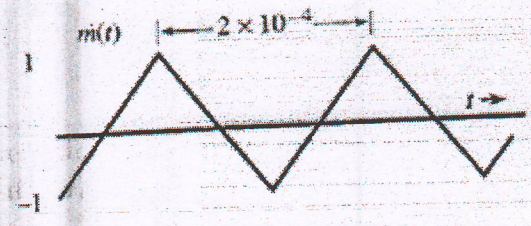
b) 4. For FM Modulator with frequency deviation of 10 kHz, modulating signal frequency of 10 kHz, Carrier amplitude voltage of 50V and Carrier frequency of 500 kHz, determine the following:

i) Minimum Bandwidth using Bessel table.

ii) Amplitudes of the side frequencies and plot the output frequency spectrum.

c) Sketch FM and PM waves for the modulating signal m(t) shown in fig.(4) .The constants K_f and K_p are $2\pi.10^5$ and $10\,\pi$, respectively, and carrier frequency F_c is 100 MHZ

fig.(4)



Problem (6)

a) An angle-modulation signal is described by the equation : $v(t) = 10cos(\omega_c t + 0.1sin2000\pi t)$.
i) Find the frequency deviation Δf ii) estimate the B.W. of $v(t)$

c) let $c(t) = 10cos2\pi f_c t$ and $m(t) = cos20\pi t$, using FM modulation with $k_f = 50$ Find:
i) The expression for $v_{FM}(t)$. ii) Determine how many harmonics should be selected to contain 99 % of modulated-signal power.

Good luck for every body, Eng. Walid T. Shanab

كلية التقنية الالكترونية - طرابلس
قسم الإتصالات
د. محمد عبدالله سعيد

المادة: اتصالات 1
الامتحان النهائي خريف2014
الزمن: ساعتـان

أجب عن جميع الأسئلة

السؤال الأول: (10 درجات)

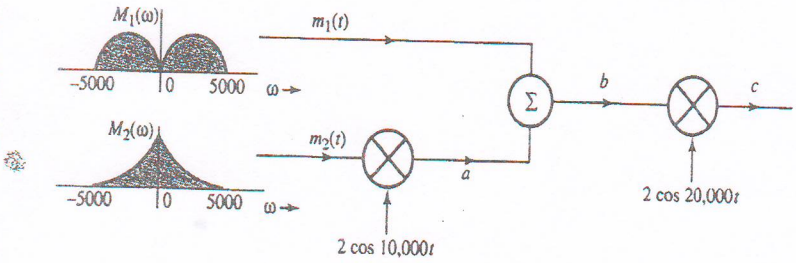
أ) أوجد القدرة الكلية في كل المركبات الطيفية لإشارة تضمين الاتساع إذا كان اتساع إشارة الحامل 15 فولت، ونسبة التضمين 66.7 % وإن المقاومة الفعلية 50 أوم؟

ب) ماقيمة عرض النطاق الترددي ونوع المستخلص (الكاشف) في كل من نظم التضمين التالية:
SSB ، DSB-SC، DSB ، VSB ، NBFM؟

السؤال الثاني: (10 درجات)

اذا كانت $m_1(t), m_2(t)$ إشارتي معلومات ذات نطاق محدود 5000 راديان/ثانية، وتم تضمين $m_2(t)$ بإشارة ذات نطاق 10000 راديان/ثانية وتم جمع الاشارتين وتضمينها على إشارة حاملة بتردد 20000 راديان/ثانية كما هو موضح بالشكل التالي:

أ) أرسم طيف الإشارة عند كل من a , b, c ؟
ب) ماقيمة عرض النطاق المطلوب للارسال؟
ت) صمم مستقبل لإستخلاص كل من إشارتي المعلومات من الإشارة المرسلة ؟



السؤال الثالث: (10 درجات)

أ) وضح العلاقة بين كل من تضمين الطور وتضمين التردد؟

ب) إذا كانت إشارة المعلومات $m(t) = \cos 8000\pi t$ وتم تضمينها بنطاق جانبي مفرد وكانت إشارة الموجة الحاملة $c(t) = 10 \cos 40000\pi t$.

1. أوجد إشارة تضمين الجانب العلوي؟
2. أوجد إشارة تضمين الجانب السفلي؟
3. أرسم طيف الإشارة لكل جانب موضحا قيمة التردد والاتساع؟

السؤال الرابع: (10 درجات)

أ) متى يكون عرض النطاق الترددي في تضمين التردد مساويا لعرض النطاق الترددي في تضمين الاتساع؟

ب) لماذا يكون الفارق صغير جدا بين عرض النطاق الترددي الصحيح (الناتج عن قاعدة كارسون) وعرض النطاق الترددي المعتاد في تضمين التردد عندما تكون قيمة β كبيرة؟ أذكرمثال للمقارنة على ذلك؟

ت) إذا كان لدينا إشارة معلومات تم تضمينها بإشارة لها تردد 200kHz وكانت إشارة تضمين التردد على النحو التالي:
$FM(t) = 5Cos(\omega_c t + 2\sin 4000t + 5\sin 3000\pi t)$ ، أوجد الاتي:

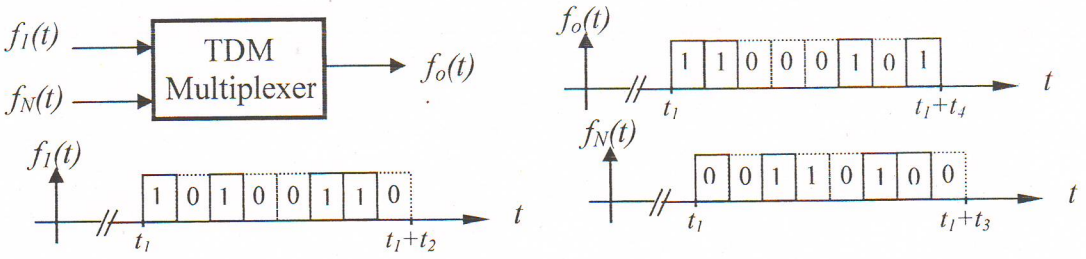
1. قدرة إشارة التضمين؟
2. الإنحراف الترددي؟
3. معامل التضمين؟
4. عرض النطاق الترددي المطلوب؟

بالتوفيق إن شاء الله

TRIOLI INSTISTUTE OF ELECTRONICS TECHNOLOGY

SUBJECT: - Communications Systems | **DATE: - 11 – 7 - 2012**
COURSE NO. : - CM 303 | **Final Exam**
Spring 2012 | **Time: - 2 Hours**
OPEN BOOK EXAM.

Q1. The given TDM multiplexer has "*N*" input signals. $f_1(t)$ and $f_N(t)$ represent the first and last input signals respectively. the output signal was represented by $f_o(t)$.



a) *What is N, if* $t_2 = t_3 = 3.90625$ μs and $t_4 = 51.613$ ns? **(5)**

b) *What is* t_4, *if* $t_2 = t_3 = 5.181$ μs and $N = 20$? **(5)**

c) Suggest two values of t_4 if $t_2 \neq t_3$. **(5)**

Q2.a) Are of the following code is valid PN code for CDMA system? Give reason.

(*i*) 101001010010011 (*ii*) 010110000 **(10)**

b) What are the advantages of frequency hopping over DS spread spectrum? **(5)**

Q3. A design of 7 GHz DMR link to be installed between two stations separated by 40 km in very flat area has the following specifications:-

- P_T= -28 dBm, P_{th} = -82 dBm,.
- The Equalizer Improvement Factor = 2" dB".
- The feeder loss is 0.1dB/m and diameter of the antennas is 2m.

If the link redesigned using 2 GHz frequency, what is the power gain should be add to the transmitter to keep the same fade margin? **(30)**

Q4. A 202 km fiber optics link connects two locations using one repeater. The pulse dispersion limits the distance between repeaters. The system bite rate is 155 MBPS and has the following specifications :-

- The terminal has 3.085 ns pulse width, 20 dBm P_t, -3.25 dBm $P_{threshold}$, and 0.005 NA.
- Led life time is 4 years, Led power reduction factor 0.75 dB/year.
- The fiber core refraction indexes are 1.5,
- The modal dispersion is 0.02333 ns/km.
- Maximum incident angle 0.3138
- The cable available in 1 km pieces and has 0.1 dB/km loss.
- The system power margin 4 dB.

a) What is the splicing loss per kilometer? **(15)**

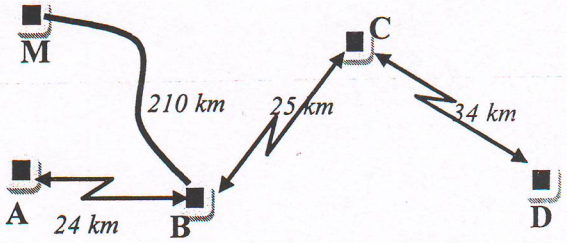
b) If the fiber replaced by another one having the same material and very small core diameter, what is the maximum distance between repeaters **(15)**

Good luck for every body
Dr. T. Benmusa

TRIOLI INSTISTUTE OF ELECTRONICS TECHNOLOGY

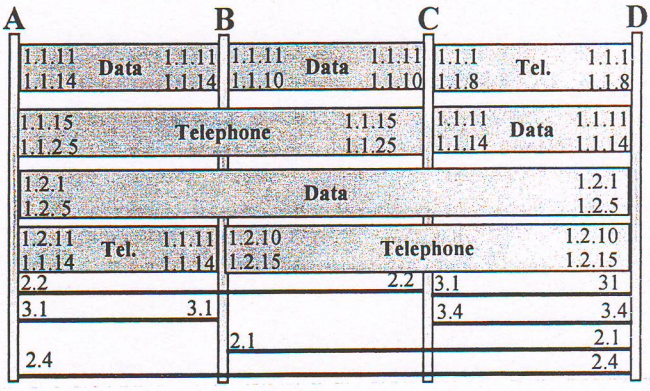
SUBJECT: - Communications Systems **DATE: - 22 – 7 - 2011**
COURSE NO. : - CM 303 **Final Exam**
Spring 2011 **Time: - 2 Hours**
OPEN BOOK EXAM.

A DMR system is connecting four locations, namely; "A", "B", "C" and "D". From "B", ST|M 16 fiber optics link is connecting another site, "M", as shown below. The MUX plan for the DMR is given below. In addition to that, a CDMA system is installed station "A" based on DS-SS technology. The systems have the following specifications:-



For the DMR

- Tel cards can serve up to 4 channels per card.
- Data cards can serve up to 6 channels per card.
- P_T= -10 dBW, P_{th} = -80 dBm,
- The used frequency is 9 GHz.
- The Equalizer Improvement Factor = "3 dB".
- The used antennas have 2m diameter.
- The feeder loss is 0.05 dB/m.
- All areas are flat area.
- Max rain attenuation 2 dB.



For the FO link

- The terminal has 0.1 ns pulse width, 10 dBm P_t, -10 dBm P_{th}, and 0.01 NA.
- The cable has 0.02 dB/km loss, and splicing loss is 0.03dB.
- The system has minimum power margin 1.80 dB.
- The transmitter and receiver Numerical Apertures are 0.12 and 0.15 respectively.
- The maximum incident angle at the fiber terminal is 9.96°.

For the CDMA system

- Each CDMA terminals produces 10 dBm, average power amplitude.
- The system has 100,000 process gain.
- The channel noise power was flat over the spectrum and equal 0.29 μW/Hz.
- The free space loss between the base station and terminals are 30 dB.
- The minimum SNR is 11.024 dB.

Questions

1. Without any new hardware, how many tel. chan. can be added between A and D? *(15)*
2. How many 2 MBPS streams can be added between A and D currently? *(5)*
3. How many 8 MBPS streams can be added between A and C currently? *(5)*
4. What is the maximum and minimum fade margin in the DMR links? *(25)*
5. What is maximum no. of CDMA subscribers *(25)*
6. What is the length of the fiber cable drums? *(25)*

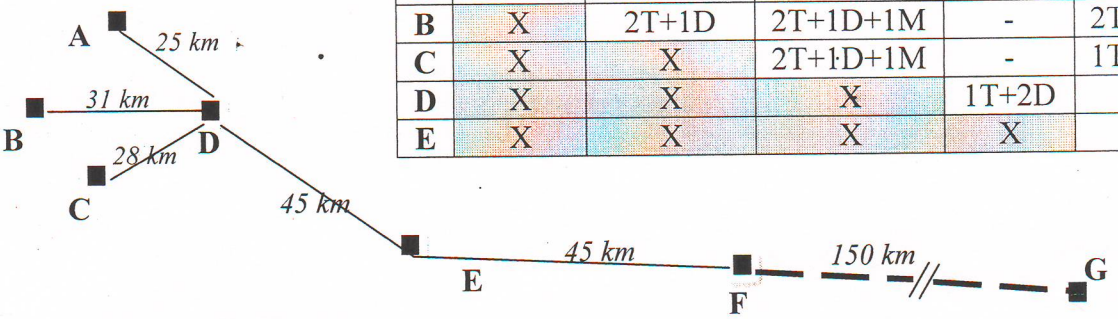
Good luck for every body
Dr. T. Benmusa

TRIOLI INSTISTUTE OF ELECTRONICS TECHNOLOGY

SUBJECT: - Communications Systems **DATE: - 26 – 6 - 2010**
COURSE NO. : - CM 303 **Final Exam**
Spring 2010 **Time: - 2 Hours**
OPEN BOOK EXAM.

The communication network below is connecting seven locations "A" to "G". F-G link is STM1 fiber optic link with no repeaters, and all other links are DMR with different capacities. The provided traffic over the DMR links is given in the following table where T is telephone channel, D is data channel, and M is 2MBPS stream.

	B	C	D	E	F
A	1T+2D	1T+1D	1T+2D+1M	-	1T+2D+1M
B	X	2T+1D	2T+1D+1M	-	2T+1D+1M
C	X	X	2T+1D+1M	-	1T+2D+1M
D	X	X	X	1T+2D	7M
E	X	X	X	X	1T+1D



For the DMR System

- P_T= 28 dBm, P_{thr}= -82 dBm and the Equalizer Improvement Factor = "2dB".
- The used frequency band is 7 GHz.
- Available antennas diameters are 0.6m, 1m, 1.2m, 1.5m, 1.8m, and 2.0m.
- Feeder loss at each link side 2.5 dB.
- Three types of fading are expected in the area; F_1 = 25dB, F_2 = 15dB, and F_3 = 5dB.
- A-D, B-D, and C-D links suffer from the three types of fading (F_1, F_2 and F_3), where D-E and E-F links suffer from the last two types of fading only (F_1 and F_2)
- Space and frequency diversities give 7dB and 5dB respectively.
- Data card serves up to 6 channels, and Telephone card serves up to 8 channels.

For the FO System

- The fiber has 0.01dB/km loss
- The core refraction index is 1.5, and the fiber Numerical Aperture is 0.005477.
- The terminal has 0.1 ns pulse width, 7 dBm output power, 0.02 Numerical Aperture, and -10 dBm threshold receiver power.
- The cable available in 1km pieces and the splicing loss is 0.015dB

Questions

1. Sketch the MUX plan for A-B link. *(10)*
2. Sketch the MUX plan for F-E link. What is the number of data and telephone and data channel cards? *(10)*
3. Suppose no diversity used in A-D link, what size of antenna should be used? *(10)*
4. If 1.2m antenna used in E-F link, find the type of the used diversity in this link? And what is the additional fade margin for the link over the given three fading? *(20)*
5. By increasing the number of subscriber of a Direct Sequence Spread Spectrum system, the coverage distance increase or decrease? And Why? *(10)*
6. What is the max no. of additional possible splices without affecting the quality? *(10)*
7. What is the maximum bit rate can be transmitted over the fiber optics links? *(10)*

Good luck for every body

Dr. T. Benmusa

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النهائى خريف 2007 ف المادة: مبادى اتصالات1 الزمن: ساعتان

Q1-An AM broadcast transmitter is tested by feeding the RF output a 50-Ω (dummy) load. Tone modulation is applied. The carrier frequency is 850 KHz and the total power output is 5000W. The sinusoidal tone of 1000 Hz is set for 90% modulation.

a. Evaluate the total power in dB units
b. Write an equation for the voltage that appears cross the 50- Ω load, giving numerical values for all constants.
c. Sketch the spectrum of this voltage as it would appear on spectrum analyzer?
d. What is the average power that is being dissipated in the dummy load?

Q2-I- A DSB-SC signal is modulated by m (t) = cos $\omega_1 t$ + 2 cos $2\omega_1 t$. Where $\omega_1 = 2\pi f_1$, f1 =500 Hz, and Ac = 1.

a- Write an expression for the DSB-SC signal?
b- Evaluate and sketch the spectrum for this DSB-SC signal?
c- Find the value of the average power?

II- An SSB-SC transmitter is modulated with a sinusoids m(t) = 5cos ω_1 , where $\omega_1 = 2\pi f_1$, f1= 500 Hz and Ac =1

a- Find the expression for the lower SSB signal?
b- Find the normalized average power of the SSB signal?

Q3- an FM transmitter has the block diagram shown in Fig-1. the audio frequency response is flat over the 20-Hz to 15 KHz audio band. The FM output is to have a carrier frequency of 103.7 MHz and a peak deviation of 75 KHz .

a- Find the bandwidth
b- Find the center frequency required for the band pass filter.
c- Calculate the frequency f_o of the oscillator.
d- What is the required peak deviation capability of the FM exciter?

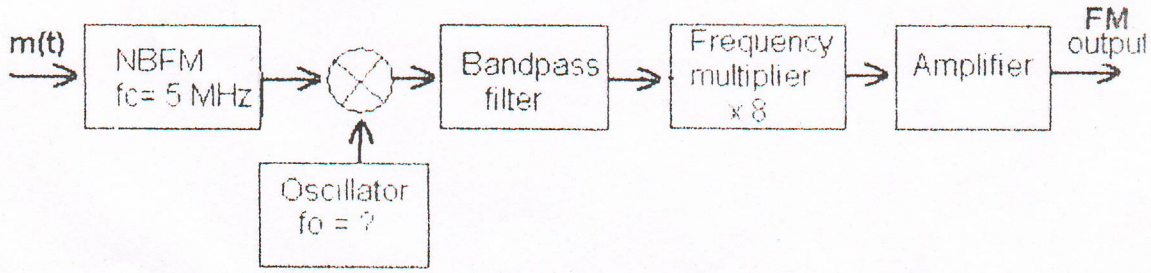


fig-1

Q4:- an PM signal has a deviation of 6 kHz, and is modulated by a sine wave with a frequency of 2 kHz. The carrier frequency is 150MHz, and the signal has a total power of 10 W, operating into an impedance of 50 ohm.

a- What is the modulation index?
b- How much power is present at the carrier frequency?
c- What is the voltage level of the second sideband?
d- What is the bandwidth of the signal, ignoring all components that have less than 30% of the total signal voltage?

Note : $\sin(x+y)=\sin(x).\cos(y)+\cos(x).\sin(y)$ $\cos(x+y)=\cos(x).\cos(y)-\sin(x).\sin(y)$

$\cos(x).\cos(y)=\frac{1}{2}[\cos(x-y)+\cos(x+$ $\sin(x).\sin(y)=\frac{1}{2}[\cos(x-y)-\cos(x+y)]$

$\cos(0)=\frac{1}{2}[\exp(j0)+\exp(-j0)]$

المعهد العالي للمهن الالكترونية / طرابلس

امتحان النهائى ربيع 2005 ف المادة: مبادى اتصالات1 الزمن : ساعتان

Q1:-The signal m (t) =2 cos 200π t is modulated by the carrier c(t)= cos 2000 π t using DSB-FC modulation. If the modulation index is (m = 1)

a) Find the power of the sidebands.
b) Find the power of the carrier (after modulation).
c) Find the efficiency using only m.
d) Find the efficiency using the Power of the carrier and sidebands.
e) Plot the time signal *m(t)*
f) Plot the time signal, *c(t)*
g) Plot the time signal s(t) *DSB*-FC.
h) Plot the spectrum of *m(t)*. *i.e.* M(f).
i) Plot the spectrum of *c(t)*. *i.e.* *C*(f).
j) Plot the spectrum of s(t). i.e. S(f).

Q2:-I) Compare between AM, DSB and SSB

II) The Transmitted Carrier Amplitude Modulation signal has the following value:

$s(t) = (A + m(t))\cos 200\pi t$

$A = 4$

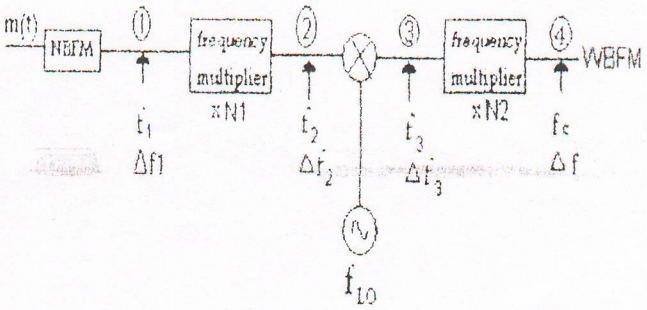
$m(t) = 4\sin 20\pi t$

a) Find the power of A
b) Find the power of $m(t) = 4\sin(20\pi t)$
c) Find the power of $s(t) = (A + m(t))\cos 200\pi t$

Q4:- An angle modulated signal is described by $s_{EM}(t) = 10\cos(2000\pi t + 20\sin 20\pi t)$. Suppose the modulation is PM

a) What is the modulating signal $m(t)$ if $k_p = 2$.
b) Find the average power of the modulated signal.
c) Find the frequency deviation.
d) Find the bandwidth of the modulated waveform (Carson's Rule).
e) Find the modulation index
f) Is this NBPM or WBPM? Explain your answer.

Q4: Block diagram of an indirect (Armstrong) FM transmitter is shown in Fig (1). Compute the unknown parameter at points (1,3,4) in this figure if the f_2=12.8MHz, Δf_2=1.6kHz, f_{LO}=10.8MHz, N1=64 and N2=48



Fig(1)

HIGH CENTE OF ELECTRONICS PROFFESSIONS

SUBJECT:- Communication Systems
COURCE NO.:- CM303
FALL 2005

DATE:- 18- 1 - 2005
FINAL EXAM
TIME:- 2 ½ HOURS

OPEN BOOK EXAM

The figure below shows a private communication network of an oil company. The network consisted of 300 km fiber optics links from station "B" to station "A" using 9 repeaters, and another 200 km fiber optics link from station "C" to station "A" using 5 repeaters. The link capacity in both directions is 155 MBPS. Station "A" is connected with station "D" through 34 MBPS DMR link. In addition to that, a satellite link provides a communication facility between station "A" and station "E". The system providing the following traffic, (where V means voice channel, D means 64 Kbps data channels and M means MBPS data stream): -

	Station "B"	Station "C"	Station "D"	Station "E"
Station "A"	3x8M	3x8M	1x8M + 9D + 5 V	2M + 9V
Station "B"		2x8M	2x2M + 3D + 9V	10xD + 5V
Station "C"			3x2M + 3D + 8V	10xD + 5V
Station "D"				4D + 10V

The technical specifications of the systems are as follows.

A. For the Optical fiber link

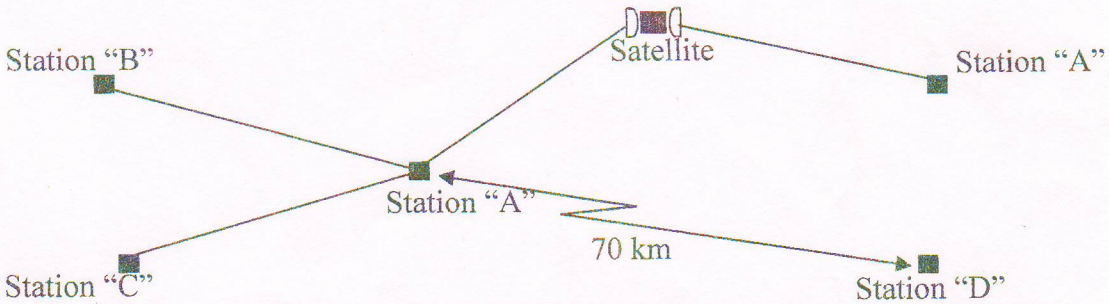
- P_t = -17dBW, detector sensitivity = -25dBm, terminal NA= 1.04, and the pulse width = 0.4ns.
- The refraction indexes of the fiber cladding and core are 1.5 and 1.35 respectively.
- The fiber loss factor is 0.75 dB/km, splicing loss 0.7 dB, total dispersion is 9 ps/km and the fiber is available in 10 km pieces.
- The losses of the area difference, misalignment and air gap are zeros.

B. For the DMR link

- P_t = 20 dBm, receiver $P_{threshold}$ = -80dBm, Operating frequency 7Ghz, antenna size 4m.
- L_f =0.1 dB/m, flat train and no future height, 5dB rain loss, and FM should be ≥ 50dB.
- Improvement factors are; 2dB for equalizer, 4dB and 6dB for Space and frequency diversities.

C. For the Satellite link

- $EIRP)_{sat}$ = 70 dBW. Frequency band 11/14 GHz.
- The satellite coverage area is 500 mile, and 30 dB fade margin is required at the receiver.
- Minmum C/T = - 60 dBW/K.



1. Between "A" and "D", how many V channels can be added without any new hardware, and how many D channels can be added if plenty of channel cards are available in the stock. *(15)*
2. Who many hops between repeaters between station "A" and station "D"? *(20)*
3. What is the fade margin of the microwave link at Tripoli? *(20)*
4. What is the minimum Figure of merit for the earth station at "A"? *(15)*
5. Who many times the fiber between stations "A" and "B" can be cut accidentally and repaired with out affecting the over all performance? *(20)*
6. What is the pulse width at the receiver? *(10)*

GOOD LUCK FOR EVERY BODY

Dr. T. Benmusa

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النهائى خريف 2004 ف المادة: مبادى اتصالات 1 الزمن : ساعتان

Q1:- A DSB transmission contains 10 KW. This transmission is to be replaced by a standard amplitude modulation signal with the same power content and the percent modulation is 80%. Determine

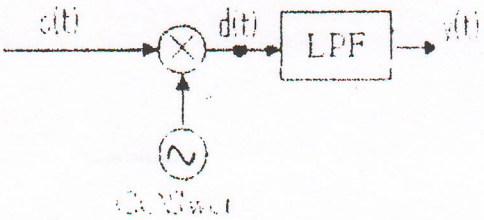
a: The power content of the carrier (P_c=7575.76w)

b: The power content of the each side band (P_{usb}=1212.12w)

c: the efficiency (η)

Q2-i- compare between AM, DSB and SSB

ii: show that an SSB signal can be demodulated be synchronous detector of figure(1)



Fig(1)

Q3 a frequency modulated signal is described by equation

$C(t)= 10 \cos (2\pi 10^8 t+10 \cos (2\pi 10^4 t))$. Determine

i-the bandwidth of the modulated signal

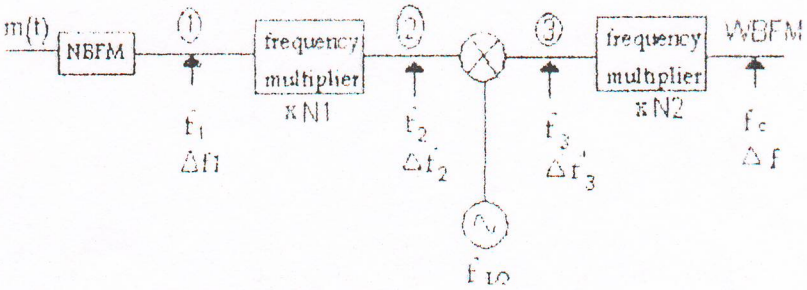
ii-the maximum frequency deviation (Δfmax)

iii-the modulation index (β)

iv-the power in the carrier component

v- If the bandwidth (w) = Δfmax. Determine the total power of this bandwidth (P_w)

Q4: i. Block diagram of an indirect (Armstrong) FM transmitter is shown in Fig (2). Compute the unknown parameter at points (1,2,3) in this figure if the f_c=96MHz, Δf=76.8kHz, f_{LO}=10.8MHz,N1=64 and N2=48



Fig(2)

ii-In the figure (3) if m(t)= 2cos w_mt , K_{FM}=3 and c(t) = 10 cos w_ct.
what will be s(t)

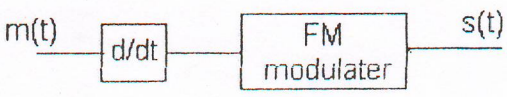


fig (3)

Notes

sin(x+y)=sin(x). cos(y) + cos(x). sin(y)

cos(x+y)= cos(x).cos(y) - sin(x).sin(y)

cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]

sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]

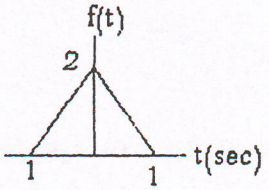
cos(0) ½ [exp(j0) + exp(-j0)]

المعهد العالي للمهن الالكترونية / طرابلس

امتحان النهائي ربيع 2004 ف المادة: مبادى اتصالات1 الزمن: ساعتان

Q1-a: Given that F [f (t)] = $(\frac{j}{w})(e^{-jw}-1)$

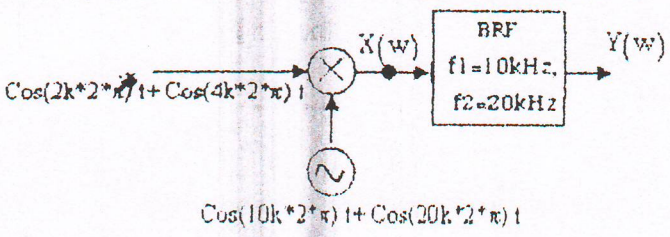
i- x(t) = f(t)+3 ii- h(t) = f'(t)



b:-Find the Fourier transform of the signal in fig (1)

fig(1)

Q2-a- From figure (2) Sketch the spectrum of the X(w) and Y(w)



fig(2)

b: Determine the percent modulation of an AM wave whose total power content is 2500W and 400W in each of its sideband when the carrier is modulated by a simple audio tone.

Q3:- an Fm signal has a deviation of 10 kHz, and is modulated by a sine wave with a frequency of 5 kHz. The carrier frequency is 150MHz, and the signal has a total power of 12.5 W, operating into an impedance of 50 ohm.

a- What is the modulation index?
b- How much power is present at the carrier frequency?
c- What is the voltage level of the second sideband?
d- What is the bandwidth of the signal, ignoring all components that have less than 1% of the total signal voltage?

Q4- Four signal each have BW= 3 kHz, are to be multiplexed with 1-KHz guard bands between channels before modulation. The subcarrier modulation is USSB, except for the lowest channel which is unmodulated, and the carrier modulation is AM. Sketch the spectrum of the baseband signal and transmitted signal and calculate the transmission bandwidth.

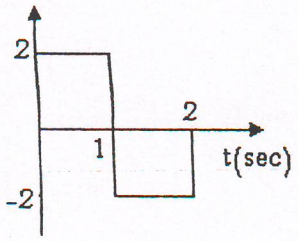
المعهد العالى للمهن الشاملة 2 مارس / طرابلس

امتحان النهائى ربيع 2004 ف المادة: مبادى اتصالات1 الزمن : ساعتان

Q1-a: if the Fourier transform of f (t) is $F(w) = \dfrac{10}{(2+jw)(5+jw)}$

Determine the transforms of the following

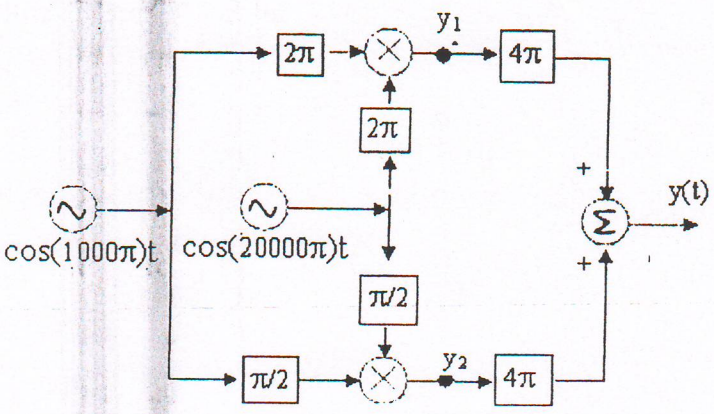
i-f(-3t) ii- f(2t-1)



fig(1)

b:-find the Fourier transform of the signal in fig (1)

Q2-a- from figure (2) find y_1, y_2 and $y(t)$



fig(2)

b : determine the percent modulation of an AM wave which has a power content at the carrier of 8kW and 2kW in each of \its sideband when the carrier is modulated by a simple audio tone.

Q3:- an Fm signal has a deviation of 3 kHz, and is modulated by a sine wave with a frequency of 1 kHz. The carrier frequency is 160MHz, and the signal has a total power of 5 W, operating into an impedance of 50 ohm.

a- Calculate the RMS signal voltage V_T?

b- Calculate the RMS voltage at the carrier frequency and each of the first three sets of sidebands?

c- For the first three sideband pairs, calculate the frequency of each sideband?

d- Sketch the signal in the frequency domain, as it would appear on a spectrum analyzer. The vertical scale should be power in dBm and the horizontal scale should be frequency?

Q4:- four signal each have BW= 3 kHz, are to be multiplexed with 1-KHz guard bands between channels before modulation. The subcarrier modulation is USSB, except for the lowest channel which is unmodulated. Sketch the spectrum of the baseband signal and calculate the baseband bandwidth.

المعهد العالى للمهن الالكترونية / طرابلس

امتحان النهائى خريف 2004 ف المادة: مبادى اتصالات1 الزمن : ساعتان

Q1-a: find the Fourier transforms of the sine-wave pulse shown in figure (1)

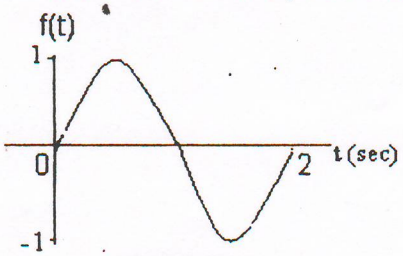
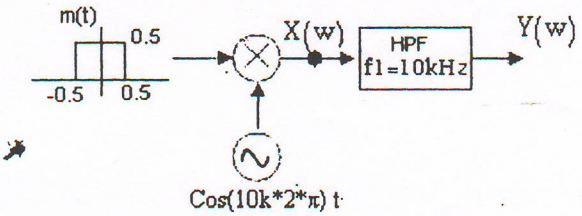


figure (1)

b: From figure (2) Sketch the spectrum of the X(w) and Y(w)



fig(2)

c: An DSB transmission contains 1kW. Determine the power content of the carrier and each of the sidebands when the percent modulation is 100%.if this transmission is to be replaced by a standard AM signal and SSB signal

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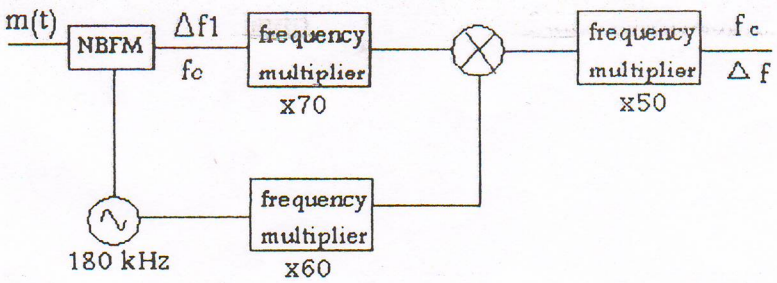
Q2-a: Consider an angle modulated signal $Xc(t)= 5 \cos (wct +5\sin wmt)$
Assume FM and f_c = 200 KHz and f_m = 2 KHz . Calculate the modulation index and find the bandwidth when a) f_m is 4 KHz b) f_m is 1 KHz

b: A PM signal is described by $Xc(t)= 10 \cos (2\pi\ 10^5\ t+ \sin\ 10^2\ \pi\ t)$
And Kp=10 Find modulation index (β) and message signal (m (t))

C:- A block diagram of an indirect Fm transmitter is shown below. Compute the maximum frequency deviation Δf and f_c of the output of the FM transmitter if the f_1=180 kHz and Δf_1=20 Hz are the output from NBFM.



Notes
sin(x+y)=sin(x). cos(y) + cos(x). sin(y)
cos(x+ y)= cos(x).cos(y) - sin(x).sin(y)
cos(x).cos(y)= ½[cos(x-y) + cos(x+y)]
sin(x).sin(y)= ½[cos(x-y) - cos(x+y)]
cos(θ)= ½ [exp(jθ) + exp(-jθ)]

Communications' Systems
Final Exam -(2 hours)

Instructor: Abdulfatah M. Shamess **Date: 5 July 2003**

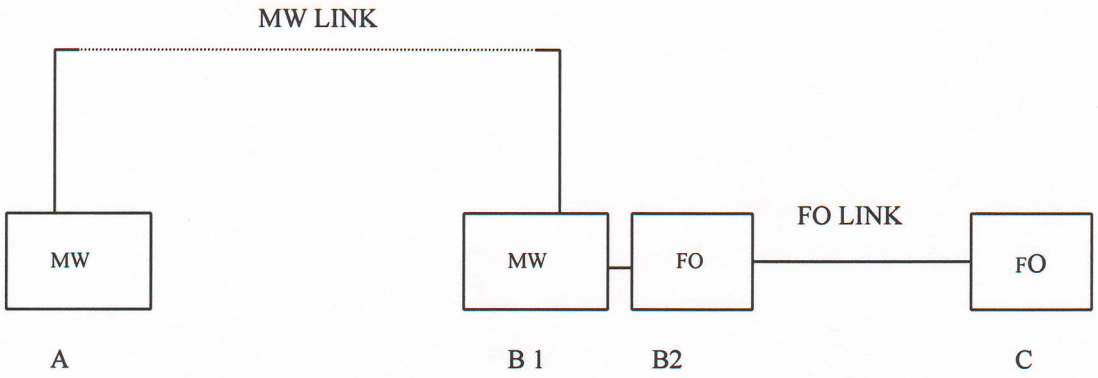
Answer *ALL* questions

1. Briefly answer the following (*text should be in one page,three lines per sub-question*):

   - What are the sources of interference in Cellular system? Explain the effect of the interference on the capacity of such systems.
   - What is SIR in Cellular system?
   - Explain what is meant by diversity and describe the various types of diversity.
   - Describe the mechanism by which dispersion takes place in optical fibres. How does the dispersion limit the maximum data rate that an optical fibre can carry?
   - What are the active and passive repeaters of microwave links.?
   - What is the difference between the HF radio systems and The Microwave radio systems?
   - What is the ionosphere refractive index? State the expression of this index?

2. A microwave link operating at 18 GHz employs two towers of heights 80m.
   (i) Check if these towers' heights are sufficient to give the required clearance to a LOS where there are two obstacles on a distance of 10 km and 30 km from site A and heights of 20m and 40m. The distance between the two sites is 35 km. Note that all heights are referenced to MSL.
   (ii) Determine the required transmitted power if the receiver threshold is –80 dBm, cable loss is 1 dB/2m , and antenna diameter is 3m.
   (iii) Determine the required antenna diameter (at TX&RX) if the transmitted power in (b) is reduced by 50%.

3. A company owns three office locations in Tripoli as shown below; site A is the main office, site B and C are services' offices. Distances between A & B is 7 km, between B1 & B2 is 100 m of copper cable , and between B2 & C is 10 Km. There are two obstacles between A & B1 at 0.5 km and 5.0 km from A with heights of 40m and 50m.Calculate the following:
   - Towers' Hieghts.
   - Calculate the fibre cable loss per km and the necessary communication equipment between B1 & B2 to keep the signal reaches site C if the fibre optic transmitted power range is between 0 and 3 dBm and the fibre optic receiver threshold is between -25and -35 dBm. (connector loss = 0.4 dB, splice loss = 0.08 dB, drum size= 4 km). If a Fibre link is installed between A &B what is the required drum size to keep the cable loss minimum?



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