1550 nm). With n_{eff} = 1.5 in a silicon waveguide, show that the waveguide length difference must be given by:

$$\Delta L = \frac{c}{2n_{eff}\Delta v}$$

Calculate ΔL. Explain with the aid of sketches how you can build a 4 x 4 multiplexer from this 2 x 2 multiplexer.

b- Consider an N node star network in which 0 dBm of optical power is coupled from any given transmitter into the star. Let the fiber loss be 0.3 dB. km. Assume the stations are located 2 km from the star, the receiver sensitivity is -38 dBm, each connector has a 1 dB loss, the excess loss in the star coupler is 3 dB, and the link margin is 3 dB.
   i. Determine the maximum number of stations N that can be incorporated on this network.
   ii. How many stations can be attached if the receiver sensitivity is -32 dBm?

c- Consider an optical link that consists of a LED with output power of -13 dB coupled into fiber flylead. A silicon PIN receiver with sensitivity of -42 dB. Two connectors at the ends; each has loss of 1 dB. The fiber attenuation is 3.5 dB/Km. The system margin is 6 dB. The system bit rate is 20 Mb/s. Find the length of the transmission path. Represent the link power budget graphically.

Question 4: **(Answer two points only)**

a- For a multi-channel optical amplitude modulation system consisting of N=3 channels, where the intermodulation products appear, find the number of triple beat terms IM products, the number of the two-tone terms IM products, the number of the IM triple beat products around the second carrier, and the number of the two-tone products around the second carrier. You can make use of the following equations:

$$D_{1,2} = \frac{1}{2}\left\{N - 2 - \frac{1}{2}\left[1-(-1)^N\right](-1)^r\right\}$$

$$D_{1,1,1} = \frac{r}{2}(N-r+1) + \frac{1}{4}\left\{(N-3)^2 - 5 - \frac{1}{2}\left[1-(-1)^N\right](-1)^{N+r}\right\}$$

b- Is it possible to transmit frequency modulated signals over analog optical communication systems? Why? In your opinion, which is preferred, to transmit amplitude modulated signals or frequency modulated signals over analog optical communication systems? Justify your answer.

c- Derive an expression for the scattering matrix of a 3 dB Coupler. With the aid of this matrix, prove that the power is divided equally between the output ports in the 3-dB coupler.

<u>Question 5:</u> **(Answer two points only)**

a- Explain how you can build an 8×8 star coupler from 2×2 couplers. Consider a 32×32 single mode coupler made from a cascade of 3 dB fused-fiber 2×2 couplers, where 5 percent of the power is lost in each element, find the excess loss and splitting loss.

b- Explain the construction and idea of operation of phase array based WDM devices.

c- Explain the construction and idea of operation of optical filters.

<u>Question 6:</u> **(Answer two points only)**

a- Explain a mechanism to build tunable optical filters.

b- Explain a mechanism to build tunable optical sources.

c- Define the dynamic range of an optical Bus network. What is the significance of this parameter? From the loss point of view? Is it preferable to communicate with a Bus optical network or a Star network? Why?

<u>Question 7:</u> **(Answer two points only)**

a- What is the benefit of multi-carrier modulation over single-carrier modulation? Sketch the block diagram of the optical OFDM system and explain the function of each block.

b- With the aid of sketches, show the reconfiguration of the BLSR network under line failure and node or fiber cable failure.

c- Explain the frame structure for SONET and SDH networks. (The basic rate only is enough.)

Tanta University
Faculty of Engineering
Dept. of Comm. Eng.
Time allowed : 3 hours

Optical Communications
3rd Year
Date: 11-6-2011

Answer the following questions:

Question 1: (Answer two points only)

a- What is meant by the link power budget for a digital optical communication system? Explain how this budget is performed and explain the factors that should be considered in this budget.

b- Does the dispersion mechanism in optical fibers affect the link power budget? Why?

c- Does the transmitter bandwidth in an optical communication system affect its link power budget? Why? In a digital optical communication system, assume that the LED together with its drive circuit has a rise time of 15 ns. Take a typical LED spectral width of 60 nm and assume that the receiver has a 25-MHZ bandwidth. If the fiber has a 600-MHz.km bandwidth-distance product. Find the link rise time. Assume that q=0.7. Make use of the following equations:

$$t_{rx} = \frac{350}{B_{rx}}, \quad B_M(L) = \frac{B_0}{L^q}, \quad t_{mod} = \frac{0.44}{B_M}$$

Question 2: (Answer two points only)

a- What is meant by the baseline wander effect in optical communications? Explain a mechanism to reduce this effect. Is it possible to use a bipolar coding scheme to remove this effect or the only possibility is the unipolar scheme? Why?

b- Explain two sources of noise in digital optical communication systems with their causes and methods to reduce their effects.

c- Sketch the block diagram of an optical frequency division multiplexing system and explain the function of each block. Explain also how the modulation index is estimated in the multiple-signal case.

Question 3: (Answer two points only)

a- Assume that the input wavelengths of a 2 x 2 silicon MZI multiplexer are separated by 10 GHz (i.e., $\Delta\lambda$ = 0.08 nm at

Tanta University	Dept.; Elect. & electrical communications Total Mark: 85 Marks	Faculty of Engineering

Course Title: Acoustics and Ultrasonics		Year: Third
Date: /6/2011	Time Allowed: 3 Hours	No. of Pages:1

Remarks: (Answer the following questions…assume any missing data…answers should be supported by sketches)

Answer the following questions:

Problem number (1) **15 Marks**

a- Derive an expression between the sound pressure level and sound power level in dBs?

b- Draw a cross section for the full range driver and define the function of each part?

Problem number (2) **20 Marks**

a- Describe the different types of loudspeakers classified by frequency range state the properties of each type?

b- A source of sound radiates symmetrically with the following directional pressure distribution function:

$$H(\theta) = \sin^2(\theta)\cos^2(\theta)$$

Determine the directivity factor and directivity index in the direction $\theta = 35^{\circ}$.

Problem number (3) **15 Marks**

a- Describe with sketches the different types of loudspeakers enclosures?

b- Derive an expression for the capacitance variation in condenser microphones?

Problem number (4) **20 Marks**

a- Design a bass-reflex enclosure that has a resonant frequency of 120 Hz?

b- Deduce an expression for the carbon microphone sensitivity?

Problem number (5) **15 Marks**

a- Explain with sketches the principle operation of ribbon loudspeakers?

b- Compare between the different types of microphones?

GOOD LUCK

Problem number (4) (17 Marks)

[a] Suppose that DS = 0200_H, BX = 0300_H, SS = 0400_H, SP = 0001_H, and DI = 0500_H. Determine the memory address accessed by each of the following instructions, assuming real mode operation: **(9 Marks)**

1) MOV AL, [4050_H]
2) INC BYTE PTR [BX]
3) PUSH BX
4) MOV CX, [BX]

[b] Describe the operation of each of the following instructions and the content of the destination operand in each instruction after exection assuming the initial values are DS = 0300_H, BX = 3402_H, SS = 0500_H, SP = $00A0_H$ **(8 Marks)**

1) ADD SP, BX
2) SUB BH, 22_H
3) ROR BX, 2
4) MOVSX DX, BL

Problem number (5) (12 Marks)

[a] In a machine language instruction, what information are specified by the following fields? MOD filed, the D and W bits? **(6 Marks)**

[b] If a MOV DI, [BX +SI+ 40_H] instruction appears in a program, what is its machine language equivalent? **(6 Marks)**

op-code MOV is 22_H			
R/M code	Addressing mode	Code	REG filed
000	DS: [BX + SI]	011	BX
001	DS: [BX + DI]	110	SI
111	DS: [BX]	111	DI

Tanta University | Department: Electronics and Electrical Communication Engineering | Faculty of Engineering

Total Marks: 75 Marks

Course: Microprocessors Applications in Communication Systems Course Code: EEC3215 Year: 3rd
Date: June 2011 (Second term) Allowed time: 3 hrs No. of Pages: (2)

Answer the following questions

Problem number (1) (10 Marks)

Put (☑) or (x), then write correct statement **(10 Marks)**

[1] The 80386 was 32-bit microprocessor.
[2] The memory system is divided into TPA, XMS.
[3] A bus is set of common connection lines that carry the same type of information.
[4] The local descriptor table is a maximum 8192 bytes in length.
[5] In protected mode, segments can begin at any location in the memory system.
[6] MOV DS, CS
[7] PUSH 73H
[8] MOV BX, AL
[9] LES BX,CAT
[10] IN DX
[11] REP STOSB

Problem number (2) (15 Marks)

[a] Draw the internal architecture of the microprocessor 80286 then describe the use of all registers. **(10 Marks)**

[b] What is the main difference between: **(5 Marks)**

1) The real mode operation and the protected mode operation.
2) The 16-bit instruction mode and the 32-bit instruction mode.

Problem number (3) (21 Marks)

[a] For the following instructions determine the data addressing mode and define its function. (10 Marks)

1. MOV [1234_H], CX
2. INC BYTE PIR [BX]
3. DIV CH
4. SUB DI, TEMP[BP]
5. ADD DL, [BX + DI]

[b] Explain the meaning of the following instructions: (11 Marks)

1) DA DD 50_H
2) PUSHA
3) MOVSW
4) CMOVS BX, DX
5) OUT DX, AX
6) BTS AX, 4
7) MUL DI

4) a) Write down short notes about i- Static and time varying fields ii-The main antenna parameters .

b) Write the general expression for the far field radiation from the long wire antenna with an arbitrary length L, then obtain an expression for the far field pattern of:
i- $\lambda/2$ dipole. ii- $\lambda/4$ monopole .

c) Plot the **radiation pattern** and **evaluate the directivity, radiation resistance , effective length and beam width** of the following linear antennas:
i- A dipole of length 50 cm, operating at 300 MHz
ii- A monopole of height 75 m, operating at 1 MHz
iii- A folded dipole of length 5 cm, operating at 300 MHz.

d) Derive an expression for and sketch the radiated field of
i- $3\lambda/2$ dipole ii- λ monopole

---

5 a) Write down the far field radiation pattern of a traveling wave antenna with length L, and then, Plot its pattern if its **null-null beam width** is assumed to be 41.4^0 tabulating the directions of nulls, peaks and relative peak amplitudes, **then design its rhombic antenna**.

b) (1) Write down an expression for the field radiated from a circular loop antenna assuming constant current.
(2) Plot the far field patterns and evaluate Rrad ,D and beam width for the following cases:
i- A loop antenna of radius 30 cm operating at 1500 MHz.
ii- A loop antenna of radius 10 cm operating at 300 MHz.

"ربِ اشرح لي صدري ويسر لي أمري"

Dr. Abdel-Fattah A. Abu-Hashem

Department : Electronics& Communications

Tanta University

Faculty of Engineering

Course Title : Wave Propagation and Antennas 2	Course Code : EEC3111	Year : 3rd
Date : June 2011(Academic Year 2010/2011 second Term)	Allowed time: 3 hrs	No: of pages : (2)

Attempt all questions:

1- a) Write down an expression for and Sketch the space-wave attenuation function due to ground reflection in the UHF frequency limit, also, derive the expression for the maximum line-of-sight (MLOS) distance due to earth's curvature, hence obtain the limits made for range of the communication link over spherical earth indicating clearly the correction made to the obtained MLOS distance due to the effect of the tropospheric refraction.

b) A 750 MHz microwave link is operating over a distance of 60 km using antenna heights of 25 m at transmitter and 16 m at receiver. For each of the following values of refractivity gradient: $i - \frac{dN}{dh} = -0.08\ m^{-1}$ $\quad ii - \frac{dN}{dh} = -0.1\ m^{-1}$

test if line-of-sight (LOS) propagation is possible and if not, calculate a new value of the **receiver antenna height** that ensures LOS, then evaluate both the **free space loss and path loss.**

2-a) Define the critical frequency, Fc, and the maximum usable frequency , MUF , of an ionospheric layer. What is the range on earth over which the waves can be received due to the reflection from an ionospheric layer.

b) If the ionization profile of the ionosphere can be approximated by:

$N(h)= 2x10^{12}\ rect(\frac{h-300}{600})+3x10^{12} rect(\frac{h-300}{400})+4x10^{12} tri(\frac{h-300}{200})$ where h is the height in Km,

and a plane wave is incident at an angle 60^0, check if the following frequencies can be reflected or not. If they can, calculate the height of reflection and the range on earth over which the waves can be received : $f_1 = 30\,MHz\ and\ f_2 = 50\,MHz$

3-a) Show briefly the main parameters affecting the satellite communication system, then, show why the microwave band is selected for its operation.

b) For the INTELSATT VI system, calculate the required transmitted power to ensure the reception of 0.01 microwatts through the **fifth transponder** with the following parameters: the gain of the transmitting earth station $G_t = 10^3$, the gain of the receiving earth station $G_r = 25\,dB$, the gain of the receiving antenna of the satellite is $G_{sr} 30\,dB$, the gain of the transmitting antenna of the satellite is $G_{st} = 30\,dB$ and the effective gain of the satellite system $G_0 = 10^4$

(ii) N= 8, and we use Hanning window: $w(n) = 0.5 + 0.5\cos\left(\frac{2n\pi}{N-1}\right)$.

Also realize the obtained H(z) in part (i).

Question 5: ***(18 Marks)***

A discrete time band pass filter with Butterworth characteristics meeting the specifications given below is required. Find the coefficients of the filter using the BZT method:

pass band:	200-300Hz
sampling frequency:	2 kHz
filter order, N :	2

a) Plot the pole zero pattern of the discrete filter.

b) Realize the obtained $H(z)$ using Direct form II method.

With Best Wishes,

Dr. Mohamed Abd El-Rahman

	Faculty of Engineering- Tanta University		
	Department of Communications and Electronics		Final Exam of 2nd Semester - 2010/2011
	Year: 3rd	Digital Signal Processing	Exam Date : June 21, 2011
	Examiner:	Dr. Mohamed. Abd El-Rahman	Time allowed: 3 hrs.

Attempt the following questions (Neat answers and boxed results are appreciated):

Question 1: *(18 Marks)*

A digital communication link carries binary-coded words representing samples of an input signal

$$x_a(t) = 3\cos 600\pi t + 2\cos 1800\pi t$$

The link is operated at 10.000 bits/sec and each input sample is quantized into 1024 different voltage levels. **Determine:**

(a) The sampling frequency and the folding frequency.

(b) The Nyquist rate for the signal $x_a(t)$.

(c) The frequencies in the resulting discrete-time signal $x(n)$.

(d) The resolution Δ.

Question 2: *(18 Marks)*

a) For the LTI system represented by the difference equation below, determine the following:

$$y(n) = 2.5y(n-1) - y(n-2) + x(n) - 5x(n-1) + 6x(n-2)$$

(i) Impulse response $h(n)$ and compute its first fifth values.

(ii) Write a MATLAB program to compute the response $y(n)$ for input $x(n) = \cos\left(\frac{2\pi n}{256}\right)$.

(iii) Stability of the system.

(iv) Realization of the obtained $H(z)$ that requires minimum number of delays.

b) For the discrete time invariant system specified by $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$, find

i) The zero state response for $x(n) = 4^n u(n)$.

ii) Plot the pole zero pattern of H(z)

Question 3: *(18 Marks)*

a) Discuss which one of the following systems is minimum or maximum or mixed phase and write down the MATLAB program to calculate the magnitude and phase spectra for each of them.

(i) $H_1(z) = \dfrac{\left(z-\frac{1}{3}\right)\left(z-\frac{1}{4}\right)}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{5}\right)}$ (ii) $H_2(z) = \dfrac{\left(1-\frac{1}{3}z\right)\left(z-\frac{1}{4}\right)}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{5}\right)}$ (iii) $H_3(z) = \dfrac{\left(1-\frac{1}{3}z\right)\left(1-\frac{1}{4}z\right)}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{5}\right)}$

b) Consider the system described by the difference equation: $y(n) = x(n) + x(n-4)$, determine the following:

i) the first six values of its impulse response $h(n)$.

ii) its response $y(n)$ to the inputs:

$$x(n) = 5\sin\left(\frac{\pi n}{3} - 60^o\right) - 12\cos\left(\frac{\pi n}{6} + 120^o\right)$$

Question 4: *(18 Marks)*

Consider a windowed low pass FIR filter with cutoff frequency 5 kHz and sampling frequency $f_s = 20$ kHz. Find the truncated, windowed sequence, the minimum delay (in samples and in seconds) to make the filter causal, and the transfer function H(z) of the causal filter if

	TANTA UNIVERSITY FACULTY OF ENGINEERING EXAMINATION (*third* YEAR)	
	COURSE TITLE: ELECTRONIC MEASUREMENTS	COURSE CODE: EE 3203

DATE: 18/6/2011	TERM: SECOND		TIME ALLOWED: 3 HOURS

Answer the following questions

PROBLEM # ONE

a) With the aid of sketches, show the difference between accuracy and precision?

b) Mention different types of error, and give example to each type?

PROBLEM # TWO

a) Explain the operation of the strain gauge?

b) Mention different methods for dealing with noise?

PROBLEM # THREE

a) Explain the operation of astable multivibrator using 555 timer?

b) With the aid of sketches, Explain the operation of chopper stabilized amplifier?

PROBLEM FOUR

a) With the aid of sketches, Explain the operation of ramp-type digital voltameter?

b) With the aid of sketches, Explain the operation of stair case- ramp digital voltameter?

PROBLEM # FOUR (18 mark)

I. Explain how Minimum shift keying is used to conserve FSK bandwidth.

II. The Binary sequence "11001001" is applied to the QPSK transmitter
  a. Draw signal constellation diagram.
  b. Drive the values of transmitted signal.
  c. Sketch the transmitter block diagrams of 16QAM signal.

PROBLEM # FIVE (18 mark)

I. For PN code generator that consists of 3 flip flops which has initial value of 100,
  a. Find and sketch the PN code generator output signal.
  b. Draw power spectral density of the output signal.
  c. If this code generator was used in DS-SS system estimate the output signal PSD and hence detect Bandwidth required for transmission.

II. Draw block diagram of FH-SS transmitter and receiver.

Good Luck,

Dr. Salwa Serag Eldin

TANTA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRONICS & ELECTRICAL COMMUNICATIONF

EXAMINATION (*THIRD* YEAR)

COURSE TITLE: DIGITAL COMMUNICATION SYSTEMS	COURSE CODE: EEC 3220

DATE: 18/6/2011	TERM: SECOND	TOTAL ASSESSMENT MARKS: 90	TIME ALLOWED: 3 HOURS

Answer the following questions

PROBLEM # ONE (20 mark)

I. State whether the following statements true or false, then comment on your answer

a. Differential PCM is used to encode signal samples onto time axis.
b. Overload noise occurred in quantizer when the input signal amplitude exceeds the maximum voltage of the quantizer.
c. In digital companding, the slope of each segement is exactly twice that of the previous one.
d. B8ZS is strongly suggested to be used in Local Area Network.
e. In all-PCM network signals should be converted into radio frequency through digital modulation techniques.
f. Coherent detection with matched filter is used in OOK detection when AWGN is large.
g. Pulse duration does not affect PAM bandwidth.
h. Multilevel signaling takes Bandwidth much smaller than that of binary signaling.
i. For law probability of error, data rate should be larger than shannon's channel capacity.
j. The PN code in DS-SS is independent on data sequence.

PROBLEM # TWO (20 mark)

I. Discuss different types of noise occurs in Delta Modulation then, hence deduce the optimum value of step size for sinusodal signal.

II. Consider a uniform quantizer of mid-tread type. Assume Gaussian-distributed random variable with zero mean and unit variance is applied to the quantizer input.

a. What is the probability that the amplitude of the input lies outside the range -4 to +4?
b. Using the result in part (a), show that the output signals to noise ratio is given by:

$$(SNR_o) = 6R - 7.2dB$$

Where R is the number of bits per sample. You may assume that the quantizer input extends from -4 to +4.

PROBLEM # THREE (14 mark)

I. Derive an expression for the power spectral density of the Manchester line code, hence deduce its advantages and disadvantages.

II. Draw the spectrum of FSK signal that has f_1=1270 and f_2=1070 and data rate R=300 bit/second. Then, estimate signal bandwidth.

Please Turn Over ⟶