Electronics and Electrical Comm. Dept.
Total Marks: 85 Marks

Course Title: **Electromagnetic Waves (2)**	Course Code: EEC 3214	Year: 3rd
Date: Sept., 16-6-2016	Allowed Time: 3 Hours	No. of Pages: (2)

Answer the following questions:

Question (1) [17 Marks]

a) **Explain the following terms:**
1. Define the antenna.
2. State the advantages and applications of microstrip antennas
3. Parabolic antenna with cassegrain feed provides higher gain than parabolic antenna with front feed.
4. The monopole antenna is used in TV broadcasting.
5. **State** the advantages of antenna arrays over single antenna element.

b) **Prove** that the magnetic potential vector $A(r)$ is given by

$$A(r) = \frac{\mu}{4\pi}\iiint J(r')\left(\frac{e^{-jBR}}{R}\right) \quad dv$$

c) **Explain** the following terms with **equations** and **drawing**:
1. Antenna radiation intensity.
2. Antenna effective area.

Question (2) [17 Marks]

a) For infinitesimal dipole antenna, **prove** that the magnetic potential A_z is given by

$$A_z = \frac{\mu}{4\pi} I_0 \Delta L \left(\frac{e^{-jBr}}{r}\right) \quad \hat{z}$$

b) For short dipole antenna, **Find;**
1. The electric field component E_θ
2. The average radiated power $\bar{P}_{av}$
3. The total radiated power W_{rad}
4. Antenna directivity
5. **Plot** the **E-plane** and the **H-plane** patterns if the dipole antenna is oriented in **Z-direction.**

Question (3) [17 Marks]

a) If the general form of the magnitude of the electric field component of the long dipole is given by

$$|E_\theta| = 60\,\frac{I_m}{r}\left[\frac{\cos\left(\frac{\beta L}{2}\cos\theta\right) - \cos\left(\frac{\beta L}{2}\right)}{\sin\theta}\right]$$

For $\lambda/2$ dipole antenna find:

Electronics and Electrical Comm. Dept.
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Course Title: **Electromagnetic Waves (2)**	Course Code: EEC 3214	Year: 3rd
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1. The average radiated power $\bar{P}_{av}$
2. The total radiated power W_{rad}
3. Directivity D
4. Effective length L_{eff}.
5. Plot the E-plane and H-plane patterns of the $\lambda/4$ monopole antenna.

Question (4) [17 marks]

a) Consider a travelling wave antenna, **derive** an expression of location of nulls.

b) Consider a travelling wave antenna (TWA) of length L = 3λ; **find**:

1. Locations of nulls
2. Locations of peaks
3. The relative amplitudes
4. Plot the field pattern of the antenna.
5. **Design** the Rhombic antenna in order to overcome the two main lobes problem of the TWA.
6. State the advantages and disadvantages of the TWA antenna.

Question (5) [17 marks]

(a) For parabolic antenna with second order feeder $n = 2$, **derive** an expression for the antenna illumination efficiency.

(b) **State** the advantages of the parabolic reflector antenna.

(c) A parabolic reflector antenna with $F/d = 0.5$ has a prime-focus feed with a gain function $G(\theta) = G_0 \cos^2(\theta)$.

1. Evaluate G_0 of the feeder
2. The apex angle
3. Find the antenna illumination efficiency.
4. Find the diameter of the reflector in order to obtain an antenna gain of 30dB at 10GHz.

Course Coordinator: *Dr. Amr Hussein*

Tanta University

Department: Electronics & Communications Engineering
Programme: Undergraduate
Total Marks: (75) Marks

Faculty of Engineering

Course Title: Optical Communications	Course Code: EEC3213	Year: 3rd year
Date: 02/06/2016	Allowed time: 3 hrs.	No. of Pages: (2)

Remarks: (answer all the following questions… assume any missing data… arrange your answer booklet)
You may use: $c = 3 \times 10^8$ m/s $\quad h = 6.625 \times 10^{-34}$ J.s $\quad q = 1.6 \times 10^{-19}$ C

Question No. 1 : (18) Marks

a) Does the optical power launched into a fiber depend on the wavelength of the source? (Explain briefly!) **(5) Marks**

b) An LED with a circular emitting area of radius 20-μm has a lambertian emission pattern with a 100-W/(cm^2. sr) axial radiance at a 100-mA drive current. **(6) Marks**

I. Determine the optical power that can be coupled into a step-index fiber having a 100-μm core diameter and NA = 0.22. (3) Marks

II. Determine the optical power that can be coupled from this source into a 50-μm core diameter graded index fiber having $\alpha = 2$, $n_1 = 1.48$, and $\Delta = 0.01$. (3) Marks

c) Sketch **three** kinds of mechanical misalignment that may occur when joining two fibers due to microscopic size, indicating the kind that causes the greatest power loss. **(4) Marks**

d) If you have a fiber with core radius of 25-μm and NA = 0.16. Determine the range of source radius r_s such that a lens can improve coupling efficiency within. **(3) Marks**

Question No. 2 : (24) Marks

a) Mention **six** requirements a photo-detector must meet. **(6) Marks**

b) Prove that for a sinusoidal modulated signal with m = 1 and F(M) ≈ M^x, the optimum value of avalanche gain M that maximizes the SNR,

$$\frac{S}{N} = \frac{0.5 I_p^2 M^2}{2q(I_p + I_D)M^2 F(M) B + 2qI_L B + 4KTB/R_L}$$

is given by $M_{opt}^{x+2} = \frac{2qI_L + 4KT/R_L}{xq(I_p + I_D)}$. **(6) Marks**

c) Sketch the physical structure of the pin photodiode circuit. Then, aided with energy-band diagram, explain (**briefly**) the basic principle of operation of the pin photodiode. **(6) Marks**

d) Explain (briefly) the **three** factors that affect the photo-detector response time. **(6) Marks**

Question No. 3 : (18) Marks

a) An engineer has the following components available:

I. GaAlAs laser diode operating at 850-nm and capable of coupling 1-mW into a fiber.

II. Ten sections of cable each of which is 500 m long, as a 4-dB/Km attenuation, and has connector on both ends.

III. Connector loss of 2 dB/connector.

IV. A pin photodiode receiver.

V. An avalanche photodiode receiver.

Using these components, the engineer wishes to construct a 5 Km link operating at 20-Mbps. If the sensitivities of the pin and APD receivers are -45 and -56 dBm, respectively. Which receiver should be used if a 6 dB system operating margin is required? **(6) Marks**

b) A 90-Mbps NRZ transmission system sends data using a GaAlAs laser diode that has a 1-nm spectral width. The rise time of the transmitter output is 2-ns. The transmission distance is 7 Km over a graded-index fiber that has an 800-MHz.Km bandwidth-distance product. The receiver bandwidth is 90 MHz and the mode mixing factor $q = 0.7$. **(9) Marks**

I. Determine the system rise time. (4) Marks

II. Is this rise time meet the NRZ data requirement? (2) Marks

III. Determine the system rise time if there is no mode mixing in the 7-Km link. (3) Marks

c) Mention **three** factors that affects selection of optical sources. **(3) Marks**

Question No. 4 : (15) Marks

a) A 2 × 2 bi-conical tapered fiber coupler has an input optical power level of $P_0 = 200$-μW. The output powers at the other three ports are $P_1 = 90$-μW, $P_2 = 85$-μW, and $P_3 = 6.3$-nW. Determine the coupling ratio, excess loss, insertion losses, and crosstalk (all in dB). **(5) Marks**

b) Mention **two** advantages of WDM Systems. Then, compare briefly between the two different kinds of WDM Systems. **(4) Marks**

c) Define **quantum efficiency** and **responsivity** of a photodiode. If quantum efficiency is around 90% for InGaAs at the 1300-nm wavelength. Determine the corresponding responsivity (**state its unit**). **(6) Marks**

Good luck

Dr. Mahmoud Selim (Coordinator of the Course)

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Electronics and Electrical Communications Engineering Dept.

Final Exam: Total 90 Degrees

Tanta University **Faculty of Engineering**

Course Title: Digital Comm. Systems	Course Code: EEC 3220	Year: 3ed
Date: Second Term 29/5/2016	Allowed Time: 3 Hours	No. of Pages: (2)

Answer the following Questions

Question 1: [18 Degrees]

a. Compare between the instantaneous, natural, and flat top sampling. [4 Degrees]
b. Define the inter-symbol interference, its causes, then explain in details the practical method that could be used to achieve almost zero ISI. [6 Degrees]
c. Draw and comment on the power spectral density of various line codes you have studied. [4 Degrees]
d. Explain the basic concepts of differential coding indicating its operation both in transmission and reception. [4 Degrees]

Question 2: [18 Degrees]

a. Illustrate the difference between synchronous and asynchronous line in digital transmission while giving some examples for each. [4 Degrees]
b. Explain mathematically and draw the construction of delta modulator indicating the waveforms in each stage? [3 Degrees]
c. Explain the companding process, its importance and how it can be used in brief without the mathematical relations. [3 Degrees]
d. Explain in details the transmitter of 8 levels PSK. [8 Degrees]

Question 3: [18 Degrees]

a. What do you know about the Costus loop, when it could be used, then explain its operation in details. [6 Degrees]
b. What are the three basic ways to increase the throughput of a communications resource? [2 Degrees]
c. Explain the concepts of FDM giving an example on telephone system. [6Degrees]
d. What do you know about demand assignment multiple access, then show its advantages? [4 Degrees]

Question 4: [18 Degrees]

a. Draw the spectrum of FSK signal that has f_1=1270 and f_2=1070 and data rate R=300 b/s. Then, estimate the signal bandwidth. [4 Degrees]
b. Explain and compare between the three techniques of ALLOHA systems. [8 Degrees]
c. Explain an application of Manchester line code in local area networks. [4 Degrees]
d. Show how to use the gray code to improve the performance of the high levels M-ary PSK modulation formats. [2 Degrees]

Question 5: [18 Degrees]

a. According the sampling concepts you have studied, show how many minutes of speech stereo sound you could store in a one CD floppy disk of size 700 M bytes. [4 Marks]

b. Explain the construction and operation of Carrier Sense Multiple Access Networks. [8 Degrees]

c. What is the meant by Local Area Network, then illustrate the concepts and the operation of Token Ring Networks. [6 Degrees]

With best wishes

Course Examination Committee

Assoc. Prof. Mahmoud Ahmed Attia Ali
Assoc. Prof. Salah El Dean A Khameece
Dr. Amr Hussain Hussain Abdallah
Dr. Intisar Saeid Gameey

Course Coordinator:

Assistant Prof. Mahmoud Ahmed Attia Ali

Course Title: Digital Signal Processing	Course Code: EEC3218	Third Year
Date: 9-6-2016	Allowed time: 3 hrs	No. of Pages: (2)

Answer all the following questions:

Question (1) (10 Marks)

1. Determine the response of the system whose input x(n) and unit sample response h(n) is given as follows:

$$x(n)=\begin{cases}\frac{1}{3}n & for \quad 0\le n\le 6\\ 0 & otherwise\end{cases}, \qquad h(n)=\begin{cases}1 & for \quad -2\le n\le 2\\ 0 & otherwise\end{cases}$$

2. Define the impulse response of LTI system and the cross-correlation in discrete time LTI system.
3. Find the Z-transform and ROC for the following signals:

a. $h(n)=2^n u(n+1)$ b. $h(n)=-2^n u(-n-1)$

Question (2) (20 Marks)

1. The input and output of an LTI system are given by $x(n)=3(-\frac{1}{2})^n u(n)$ and $y(n)=-(\frac{1}{2})^n u(n)-4.(2)^n u(-n-1)$.
   a. Find the transfer function H(z) with the ROC. Check the stability of the system.
   b. Determine the transfer function G(z) which satisfied the following relation $H(Z)G(Z)=1$. Then find the impulse response $g(n)$.

2. Find the inverse Z-transform for the following:

a. $X(Z)=\dfrac{Z+1}{3Z^2-4Z+1} \qquad |Z| \rangle 1$

a. $X(Z)=\dfrac{1}{(1+Z^{-1})(1-Z^{-1})^2}$ for a causal system

Question (3) (20 Marks)

1. The system function of the LTI system is given as:

$$H(z)=\frac{7-9.5z^{-1}-3.5z^{-2}+5.5z^{-3}}{(1-z^{-2})(1-0.5z^{-1})(1-1.5z^{-1})}$$

a. Specify the ROC of H(z) and determine the unit sample response h(n) for a causal, anti-causal and a stable system.
b. Realize the transfer function H(z) using direct form-II and parallel method.

2. For the LTI system shown in Figure (1), determine the following:

a. The system function H(z) and ROC.

b. The output of the system if the input $x(n) = (2)^n u(n)$ and the initial values are $y(-1) = 1, \quad y(-2) = -1.$

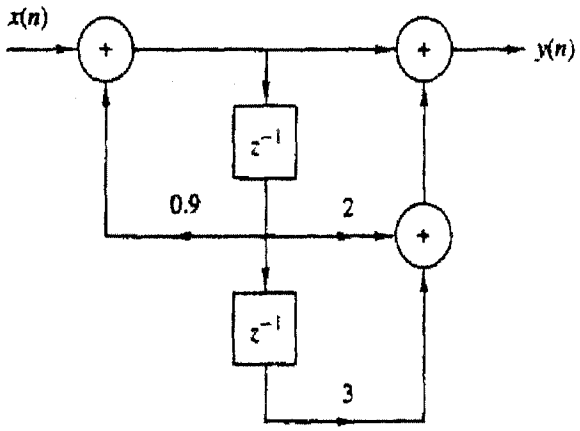


Figure (1)

Question (4) (20 Marks)

1. Determine the lattice coefficients corresponding to the FIR filter with system function:

$$H(z) = A_3(z) = 1 + \frac{1}{4}Z^{-1} + \frac{2}{3}Z^{-2} + \frac{1}{2}Z^{-3} + \frac{1}{3}Z^{-4}.$$

   a. Draw the equivalent Lattice structure.

2. Design a 5-tap FIR high-pass filter with a cut off frequency of 1.8kHz and a sampling rate of 8KHz using a Fourier series method:
   a. Determine the transfer function and the difference equation of the designed FIR system.
   b. Evaluate the magnitude frequency response for Ω=0, π/4, π/2, 3π/4, and π radians.

Good Luck

Course Coordinator: **Dr. *Entesar Saeed***

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

Total Marks: 75 Marks

Course Title: Application of Microprocessors | Course Code: EEC3215 | Year: 3th

Date: June 2016 | Allowed time: 3 h. | **Model D**

Q[1] Choose A, B, or C for the correct answer : (18 Marks)

I) For the following instructions determine the data addressing

1) MOV BX, 2000_H

A) Register B) Immediate C) Direct

2) MOV [BX], DL

A) Direct B) Immediate C) Register indirect

3) INC BYTE PTR[BX]

A) Register B) Register relative C) Register indirect

4) MOV [EBX + 2*ESI], EAX

A) Register relative B) Base plus index C) Scaled index

5) ADD LIST[BX], AX

A) Register relative B) Base plus index C) Scaled index

II) Suppose that DS=1000_H , SS= 2000_H, BX= 0300_H, BP= 1000_H , and SI=0500_H . Determine the memory address accessed by each the following instructions, assuming real mode operations:

6) MOV AL, [BP]

A) 01000_H B) 11000_H C) 21000_H

7) MOV CX, [BX+SI]

A) 03500_H and 03501_H B) 10800_H and 10801_H C) 20800_H and 20801_H

8) MOV [BX], AX

A) 10300_H and 10301_H B) 20300_H and 20301_H C) 03000_H and 03001_H

9) MOV [SI- 0300_H], CX

A) 20200_H and 20201_H B) 10200_H and 10201_H C) 01200_H and 01201_H

III) assume BX=$03FF_H$, DS=2000_H, SS=3000_H, BP=0400_H. Find the value of BX after execution the following:

10) INC BL

A) 0400_H B) 0300_H C) 04FF

11) SHL BX, 1

A) $3FF0_H$ B) $01FF_H$ C) $07FE_H$

12) SUB BH, 22_H

A) $E1FF_H$ B) $03DD_H$ C) $25FF_H$

13) ADD BX , BP

A) 07FF B)27FF C) 207FF

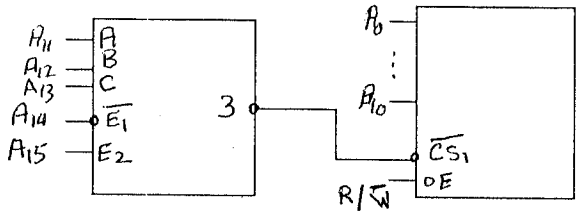
14) AND BX, $F0D2_H$

A) $F3E1_H$ B) $10D2_H$ C) $00D2_H$

15) MUL CH means

A) CH*AH B) CH*AL C) CH*AX

16) In the figure the first address is



A) $D800_H$ B) 9800_H C) $B000_H$

17) The size of the memory is

A) 2^{10} B) 2^{11} C) $2^{11}-1$

18) The type of the memory is

A)ROM B)RAM

Q[2] Choose T or F (26 Marks)

1- POP CS
2- STD
3- SUB BX, BP
4- RCR BH, CH
5- BTS BX, 3
6- MOV AH, BL
7- MOV ES, DS
8- ADD CL, [BX+10_H]
9- .CODE
10- DA DB 20_H
11- MOV CS, BX
12- INC [BX]
13- PUSH BL
14- REP STOSW
15- LDS EBX, [DI]
16- ADC BL, AH
17- MOV CX, DL
18- MOVZX BL, AX
19- The 80386 was 32-bit microprocessor.
20- MOV AX, 40_H is equivalent to MOV AX, 0040_H
21- The sign flag bit is modified by arithmetic operations
22- A bus is set of common connection lines that carry the same type of information.
23- Will an overflow occur if a signed $F2_H$ is added to a signed $0E_H$
24- JMP START is equivalent to CALL START
25- OUT CX, AX means 16 bits are output from AX to CX
26- The code segment is limited to 64 KB in 80286.

Q[3] **[a]** Write an assembly program that will move the 20 words from data table LIST to data table BLK, assume the two lists in Data segment. (4 Marks)

[b] Write an assembly program to calculate the sum of the Odd numbers from 1 to 99 then display the sum on the port number 2. (3 Marks)

[c] Explain the meaning of the following instructions: (9 Marks)

1) . MODEL SMALL
2) PUSHA
3) LODSB
4) OUT DX, AX
5) DATAS DW 20 DUP(?)
6) CMOVS BX, DH

Q[4] **[a]** Draw the internal architecture of the microprocessor 80286, and then describe the main use of the following registers. (2+4 Marks)

AX, CX, BP, DX, IP, ES

[b] Comparison between: (6 Marks)

1) The 16-bit instruction mode and the 32-bit instruction mode.
2) *LOOP instruction and JMP instruction.*

[c] If a MOV DI, [BX + 20_H] instruction appears in a program, what is its machine language equivalent? (5 Marks)

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

مع أطيب الأمنيات بالتوفيق

Course Title: Communication systems
Date: 12-6-2016
Course Code: EEC3221
Allowed time: 3 hrs
3rd Year
No. of Pages: (2)

Answer all the following questions:

Question (1) (20 mark)

1. Define the sound wave and derive an expression to evaluate the rate of energy transfer for the sound wave.
2. Define the Doppler effect of the sound wave.
3. How can an object move with respect to an observer so that the sound from it is not shifted in frequency?
4. The siren of a police car emits a pure tone at a frequency of 1125 Hz. Find the frequency that you would receive.
   (a) You are at rest, police car moving toward you at 29 m/s.
   (b) Police car at rest you are moving toward it at 29 m/s.
   (c) You and police car moving toward one another at 14.5 m/s.
   (d) You are moving at 9 m/s, police car chasing behind you at 38 m/s.

Question (2) (20 mark)

1. The intensity of a sound wave at a fixed distance from a speaker vibrating at 2kHz is 0.6w/m2.
   a. Determine the intensity if the frequency is increased to 2.5 kHz while a constant displacement amplitude is maintained.
   b. Calculate the intensity if the frequency is reduced to 0.5 kHz and the displacement amplitude is doubled.
2. Explain the effect of the wavelength of an obstacle on the diffraction of sound wave.
3. Describe the reflection phenomena of the sound wave from different surfaces. Does the reflection effect on the value of sound pressure.
4. What length of a closed pipe is needed to resonate with a fundamental frequency of 256 Hz? What is the frequency value of the second and the third overtone? Assume that the velocity of sound is 340 m/s.

Question (3) (25 mark)

1. Explain with aid of sketches the construction of the moving-coil loudspeaker and the function of each component in it.

2. Compare between an electrostatic loudspeaker and the Ribbon loudspeaker in terms of structure, principle of operation and advantages and disadvantages of each type.
3. How can Piezoelectric loudspeaker convert electrical signal to sound? Describe its operation and state some of its applications.

Question (4) (20 mark)

1. What are the precautions must be taken while using microphones?
2. Differentiate with the aid of sketches between the Dynamic, Condenser, and Ribbon microphone. Which one has more sensitivity than the others?
3. What is the meaning of the microphone Directivity pattern? State the types of the directivity patterns and the variations between them.

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DR. ENTESSAR SAEED

GOOD LUCK