(قديم)

Tanta University
Faculty of Engineering
Dept. of Elect. &Commun.

Electronic Testing & Measurement.
4th Year, TIME : 3 Hr.
Date: Jan.,25th, 2010

Answer the following questions:

1) **Set up an experiment for generating the PWM, using the block diagrams. Hence, draw and discuss the generated and measured each stage.** **(15M)**

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2) **Explain how the intelligence signal m(t) can be recovered from the PPM.** **(5M)**

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3) **What is the effect of the sampling pulse width on the output of the sampling circuit in the sample & hold Module.** **(12M)**

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4) **Illustrate the aliasing effect, and show how this effect can be avoided.** **(5M)**

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5) **Construct the circuit diagram of DM system and hence, derive from it a DΣM system.** **(13M)**

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6) **Define the slope overload noise in DM, and hence ,find the step size Δ required to prevent this noise for the case of the input signal is : $m(t) = 10 \cos 2\pi(800)t$. (10M)**

Good Luck, Prof. M. Nasr

امتحانات قديم

Academic Year 2009/2010	Faculty of Engineering - Tanta University		
	Communications and Electronics Department		Final Exam - 4th Year
		Microwave Electronics	January 2009-2010
	Examiner:	Dr. Mohamed. Abd El-Rahman	Time allowed: 3 hrs.

Answer ALL Questions — Neat Answers and boxed Results are appreciated

Question 1

a) Explain the process of velocity modulation in the double cavity klystron amplifier and derive an expression for the optimum distance between the two cavities (buncher and catcher) .

b) A two identical cavity klystron amplifier has the following parameters:
beam voltage $V_o = 1000$ V, beam current $I_o = 25$ mA, $R_o = 40$ kΩ, frequency $f = 3$ GHz, gap spacing in either cavity $d = 1$ mm, spacing between centers of cavities $L = 4$ cm and effective shunt impedance, excluding beam loading $R_{sh} = 30$ kΩ. Determine:

i) input gap voltage to give maximum voltage V_2.
ii) the voltage gain , neglecting the beam loading of output cavity.
iii) the efficiency of the amplifier, neglecting the beam loading
iv) the beam loading conductance G_B and verify its negligence in the preceding calculations.

Hint: $G_B = \frac{G_o}{2}\left[\beta_o^2 - \beta_o \cos\frac{\theta_g}{2}\right]$ and $\frac{V_o}{(V_o + V_r)^2} = \left(\frac{e}{m}\right)\frac{(2\pi n - \pi/2)^2}{8\omega^2 L^2}$.

Question 2

(a) Derive an expression for the electronic admittance of the reflex klystron.
(b) A reflex klystron oscillator operates under the following conditions.

$V_o = 600\text{V}, R_{sh} = 15\text{k}\Omega,\ f_r = 9\text{GHz}$, L = 1mm , $(e/m) = 1.759\times10^{11}$ [MKS system].

The tube is oscillating at f_r at the peak $n = 2$ mode. Assume that the beam loading, cavity losses and transit time through the gap can be neglected.
i)Find the value of the repeller voltage V_r .
ii)Find the direct current necessary to give a microwave gap voltage of 200 V.
iii)What is the electronic efficiency under this condition?

Question 3

a) Derive an expression for the circuit equation in a TWT amplifier.
b) Starting from the propagation constant of growing wave, derive expression for the power gain A_p of TWT amplifier.
c) A traveling wave tube operates under the following parameters:
Beam voltage $V_o = 2$kV, Beam current $I_o = 4$mA , characteristic impedance of the helix $z_o = 20\,\Omega$, circuit length $N = 50$ and frequency $f = 8$GHz . Determine:
i) gain parameter C.
ii) output power gain A_p in dB.
iii) all four propagation constants.

Question 4

a) Derive an expression for the equivalent negative conductance of the tunnel diode circuit.
b) The tunnel diode equivalent circuit parameters are: series resistance $R_s = 4\Omega$, junction capacitance $C_j = 1$ pF , and negative resistance $R_n = -70\,\Omega$. The diode is placed in a cavity to operate as an amplifier at center frequency 3GHz. The total cavity capacitance is 2.5pF with load and source resistances $R_L = R_g = 50\Omega$. Find the following
i) the equivalent shunt negative conductance of the diode at that frequency.
ii) the amplifier power gain iii) the amplifier bandwidth.
iv) the frequency at which the equivalent conductance of the diode vanishes

P.T.O

Question 5

(a) Derive expressions for the input power P_{in} and load power P_L for the microwave amplifier which has scattering parameters S_{11}, S_{12}, S_{21}, and S_{22}.

(b) Write down the different definitions of the two port power gains.

(c) An Amplifier is characterized by the following S-parameters:

$S_{11} = 0.78\angle -65^o$, $S_{12} = 0.11\angle -21^o$, $S_{21} = 2.2\angle 78^o$ and $S_{22} = 0.9\angle -29^o$. The input side of the amplifier is connected to a voltage source with $V_s = 4\text{V}\angle 0^o$, and impedance $Z_S = 65\Omega$. The output is utilized to drive an antenna that has an impedance of $Z_L = 85\Omega$. Assuming that the S-parameters of the amplifier are measured with reference to a $Z_o = 75\Omega$ characteristic impedance, find the following quantities:

(i) matched transducer gain G_{TM}, unilateral transducer gain G_{TU} and available power gain.

(ii) power delivered to the load P_L and the maximum power available from the source P_{avs}.

You may use the following relations:

Stability gain factor: $k = \dfrac{1-|S_{11}|^2-|S_{22}|^2+|\Delta|^2}{2|S_{12}S_{21}|}$, Delta factor: $\Delta = S_{11}S_{22} - S_{12}S_{21}$

Transducer power gain $G_T = \dfrac{1-|\Gamma_S|^2}{|1-\Gamma_{in}\Gamma_S|^2}|S_{21}|^2\dfrac{1-|\Gamma_L|^2}{|1-S_{22}\Gamma_L|^2}$ or $G_T = \dfrac{1-|\Gamma_S|^2}{|1-S_{11}\Gamma_S|^2}|S_{21}|^2\dfrac{1-|\Gamma_L|^2}{|1-\Gamma_{out}\Gamma_L|^2}$

Available power gain ..... $G_A = \dfrac{1-|\Gamma_S|^2}{|1-S_{11}\Gamma_S|^2}|S_{21}|^2\dfrac{1}{|1-|\Gamma_{out}|^2|}$

BEST OF LUCK FOR ALL,
Dr. Mohamed Abdel-Rahman

جامعة طنطا
كلية الهندسة
هندسة الالكترونات والاتصالات الكهربية

المادة/ دراسات الجدوى للمشروعات
الفرقة/ الرابعة(لائحة قديمة)

بسم الله الرحمن الرحيم
التاريخ : 3-2-2010
الزمن : 2ساعة

أجب عن الأسئلة الآتية:- *(40 درجة)*

السؤال الأول:-

1- وضح باختصار المراحل التي يمر بها المشروع المقترح للاستثمار؟
2- عرف : ما هو المشروع ؟ وما هى المراحل التي يمر بها المشروع المقترح للاستثمار؟
3- عرف : ما هي دراسات الجدوى ؟ وما هي مراحل دراسات الجدوى؟

السؤال الثاني:-

1- تختلف المشروعات وفقا للأنشطة الاقتصادية التي تقوم بتنفيذها .. أكتب باختصار ما تعرفه عن أنواع تلك المشروعات؟
2- عرف التخطيط ؟ وما هي العناصر التي تشتمل عليها عملية التخطيط؟
3- عرف المقصود بعملية التنظيم؟ - عملية التوجيه؟ وما الغرض من عمليتي التنظيم والتوجيه؟

السؤال الثالث:-

1- يمكن تقسيم المصنع على حسب طرق عمليات الإنتاج والتخطيط إلى ثلاثة أقسام رئيسية اكتب نبذة مختصرة عن هذه الأقسام.
2- تكلم عن أهم:-
(أ)- العوامل المؤثرة في حجم مرونة الطلب.
(ب)- العوامل التي يترتب عليها نقصان أو زيادة العرض.

3- كيف يمكن لصاحب المشروع أن يزيد من كفاءة عوامل الإنتاج؟
4-تكلم باختصار عن أهم مراحل تطبيق نظام إدارة الجودة الشاملة.

مع التمنيات بالتوفيق
أ.د/عبد الفتاح مصطفى خورشد

جامعة طنطا
كلية الهندسة
هندسة الالكترونيات والاتصالات الكهربية

المادة/ إدارة المشروعات
الفرقة/ الرابعة(لائحة جديدة)

بسم الله الرحمن الرحيم
التاريخ : 3-2-2010
الزمن : 2ساعات

أجب عن الاسئلة الآتية:- (40 درجة)

السؤال الاول:-

1- وضح باختصار المراحل التي يمر بها المشروع المقترح للاستثمار؟
2- عرف : ما هو المشروع ؟ وما هي المراحل التي يمر بها المشروع المقترح للاستثمار؟
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3- عرف المقصود بعملية التنظيم؟ - عملية التوجيه؟ وما الغرض من عمليتي التنظيم والتوجيه؟

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(أ)- العوامل المؤثرة في حجم مرونة الطلب.
(ب)- العوامل التي يترتب عليها نقصان أو زيادة العرض.

السؤال الرابع:-

1- كيف يمكن لصاحب المشروع أن يزيد من كفاءة عوامل الإنتاج؟
2-اكتب نبذة عن المخزون؟ وما هي وظائف المخزون؟
3- تكلم عن أهم مزايا وعيوب الجودة الشاملة.
4-تكلم باختصار عن أهم مراحل تطبيق نظام إدارة الجودة الشاملة.

مع التمنيات بالتوفيق
د/ عبد الفتاح مصطفى خورشد

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

Elective Course (3): Information Security	Course Code: EEC4126	Year: 4th
Date: Jan, 30th 2010 (First Term)	Allowed Time: 3 hrs	No. of Pages: (2)

Answer the following Questions:

Question.1 (18 Marks)

a) ***Decrypt*** the following cipher if it was encrypted using *Ceaser* Cipher: "GOODLUCK". (4 Marks)

b) Encrypt the word: **RENAISSANCE** using a cipher that replaces each character with position ***a*** (A has a=0, B has a=1, ... etc.) by another character with position $f(a)=(a+k_i) \bmod n$. (n= 26 and K_i is equal to 0 for the 1st character, 17 for the 2nd, and 19 for the 3rd and then K_i is repeated 0,17,19,0,17,19,...etc). What is the type of this cipher? (5 Marks)

c) ***Draw only*** the block diagram of one round *encryption* and *decryption* in DES algorithm. (4 Marks)

d) Compute the bits number 1, 16, 33, and 48 at the output of the *first round of the DES* ***decryption***, assuming that the cipher text is composed of all ones and the external key is composed of all zeros, and that all the S-boxes are 6-by-4 that takes the *middle 4 bits* from the 6- bit input. (5 Marks)

Question.2 (18 Marks)

a) In a public key system, Alice has the keys (n=77, e=11, d= 1[illegible]), Bob has (n=77, e=7, d= 43). Alice wants to send the word "HOPE" to Bob; it will digitally **sign** the message **then encrypt** it. Each single character will be a block and she will use the electronic code book (ECB) mode. Obtain the whole transmitted message and show using *only the last* character how Bob will recover the original word. (10 Marks)

b) State an application for Diffie-Hillman algorithm. (3 Marks)

c) Using diagrams, explain the man in the middle attack problem in Diffie-Hillman algorithm and how it can be avoided. (5 Marks)

Question.3 (16 Marks)

a) Define *Kerberos* servers. Using diagrams, explain what happens when a user want to access an FTP server. Define all terms and symbols used. (6 Marks)

b) What is meant by a challenge response? Which do you think is better, using the challenge response or using the passwords? Why? (5 Marks)

c) What are the security services the challenge response can provide? Explain (using diagrams). (5 Marks)

Question.4 (18 Marks)

a) In AH protocol, how we can distinguish the transport mode from the tunnel mode by observing the header contents? Explain your answer. Can this method be applied to the ESP protocol? (5 Marks)

b) What is meant by *security parameters*? Explain briefly how they are established for the three protocols: IPSec, SSL, and PGP. (8 Marks)

P.T.O

c) In PGP protocol, Amr, the recipient, needs to trust the public key before he can deal with it. According to the following table, which public keys can Amr fully trust? Justify your answer by explaining each case. (5 Marks)

Public Key	Key Owner	Trust Level	This owner issues certificates for ...
K_1	Ahmed	Full	Mona
K_2	Mohamed	Partial	Adel
K_3	Adel	None	Ahmed - Mona
K_4	Mona	Full	Salwa
K_5	Salwa	Partial	Adel-Mohamed

Question.5 (15 Marks)

a) "A VPN creates a network that is private but virtual. It is physically public". Explain, using diagrams, what does this statement mean and the benefits of VPN. (5 Marks)

b) What is a firewall? What are its two types? What is the main difference between them? (6 Marks)

c) A router contains the following filtering table information, what do they mean? (4 Marks)

Interface	Source IP	Source port	Destination IP	Destination port
1 (Internet)	*	*	*	23
2 (Internal Network)	194.78.20.8	*	*	80

Good Luck, Prof. M. Nasr

Tanta University

Department: Computers and Auto. Control Engineering
Total Marks: **70 Marks**

Faculty of Engineering

Course Title: مقرر اختياري خارج التخصص (٢)(النمذجة و المحاكاة)
Date: Jan 30th 2010 (First term)

Course Code: CCE3152
Allowed time: 3 hrs

Year: 4th (Communications)
No. of Pages: (2)

Remarks: (Attempt **ALL** the following problems and assume any missing data)

Problem number (1) **[18 Marks]**

a) For a **single** non-linear adaptive Perceptron, derive the gradient-descent training algorithm that can be used for the general function approximation problem. Suggest a suitable nonlinear activation function. What condition must this activation function hold? **[10 Marks]**

b)

I) Draw a sketch of a Biological Neuron showing its main parts,

II) Hence, draw the corresponding labelled artificial McCulloch-Pitts model.

III) What do the following terms mean? (Please give **short notes** about their functions).

i. Dendrites,
ii. Soma,
iii. Action potential,
iv. Synaptic junction,

[5 Marks]

c) For some systems, the Mean Squared Error (MSE) has many local minima but only one global minimum.

I) Discuss this statement.

II) When does this case happen? Explain with the aid of graphs. **[3 Marks]**

Problem number (2) **[16 Marks]**

a)

I) Derive the algorithm to find the weights vector for a **linear** Artificial Neural Network (ANN) that minimizes the Mean-Squared-Errors (MSE) when the inputs and output vectors (measurements) are available. **[7 Marks]**

II) What condition must hold for this to be a valid solution? **[1 Marks]**

b)

I) Is it possible to model the logical Exclusive-OR function of two inputs with only one Perceptron? Why? **[2 Marks]**

II) Depending on your answer, design a two-input XOR function. **[6 Marks]**

P.T.O.

Problem number (3) **[18 Marks]**

a) A system output was collected using a noisy sensor that adds a noise to the true output according to the function $h = y + 0.1(-1)^t$; $t \geq 0$, where h, y, and t are the sensor output, system true output, and the time, respectively. However, it is assumed that the system output has to follow the relation $y = -5e^{-0.25t}$; $t \geq 0$. It is required to model the system by approximating its output to be linear in the region $0 \leq t \leq 4$. If only the first five (5) samples, with 1 Hz sampling frequency, are available, find the system model using your knowledge about the ANN. **[8 Marks]**

b) Design an ANN to model the logical AND function of two inputs. **[5 Marks]**

c) According to your answer in part (b), design an electronic circuit to implement the AND function by finding the values of the resistors if the amplitude of the power supply voltage, Us, is 6 volts. **[5 Marks]**

Problem number (4) **[18 Marks]**

a) Draw and label a multi-layer Perceptron with a single hidden layer and a single output unit. Then, **only** write down (**without proof**) the training algorithm for both output and hidden layers. **[2 Marks]**

b) Verify that the derivative of the sigmoidal function of an input, u, and an output, y, can be expressed in terms of its own output thus: $\frac{dy}{du} = y(1-y)$. **[2 Marks]**

c) A three-input single-output system is governed by the equation $z = a\,x_1 + bx_2 + cx_3$, where x_1, x_2, and x_3 are the inputs; a, b, and c are constant coefficients; and z is the model output. Train to find the instrument model using steepest descent algorithm with learning rate of 0.6, and the samples to the inputs, the output, and the initial weights are $\begin{bmatrix} 0 & 1 & 2 \\ 0 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}^T$, $[2 \quad 1 \quad 3]^T$, and $[2 \quad 1 \quad -2]^T$, respectively.

. Train the ANN using:

I) Batch-training algorithm **(Calculate for only <u>two</u> epochs).** **[7 Marks]**

II) Online-training algorithm **(Calculate for only <u>one</u> epoch).** **[7 Marks]**

---(With Best Wishes)---

Course Examination Committee

Dr. Ahmed Nassef

ارقام لائحة ع ١/ ٢

Department : Electronics& Communications

Tanta University | Total Marks : Marks | Faculty of Engineering

Course Title : Antennas Design | Course Code : EEC4104 | Year : 4th
Date : February 1st (Academic Year 2009/2010 First Term) | Allowed time: 3 hrs | No: of pages : (2)

Attempt all questions:

Question (1) (25 Marks)

a- Write down **short notes** about:
i- The main types of antennas. ii- Advantages of planar arrays over linear arrays.
iii- Objectives achieved by the antenna arrays.

b- **For the** linear uniform **broadside array** consisting of N elements :
i- Write down an expression for the array factor.
ii- Derive the needed condition to avoid the presence of grating lobes.
iii- Evaluate its peak-side lobe to main lobe ratio.
iv-Estimate the array directivity and beam width considering isotropic elements .

c- Design a linear uniform **broadside array** such that no grating lobes exist in the resultant pattern and the peak-side lobe to main lobe ratio is less than **0.24** with minimum number of elements and maximum spacing. Plot the corresponding array factor and approximately estimate the beam width. If the array is along the X-axis and the elements are short dipoles oriented to Z- direction. Plot the resultant pattern in the X-Y, X-Z and Y-Z planes **and estimate the array gain in each plane.**

Question (2) (20 Marks)

a- Write down an expression for the array factor of the **non-uniform linear array** with symmetric feeding in the case of **odd number of elements.**

b- For a 7 **elements Binomial end fire array** consisting of short dipoles placed on Y-axis that oriented towards the Z-direction and separated by $\lambda/2$ spacing:
i- Estimate the elements relative feeding coefficients
ii- Plot the array factor as well as the total field pattern in the Z-X and Y-X planes.

c- For a 6 elements **Tcheby-Chave endfire array** consisting of short dipoles placed on Z-axis that oriented towards the Z-direction and separated by $\lambda/2$ spacing, plot the total field pattern in the Z-X and Y-X planes.

d- For a **8x6 elements** (short dipoles oriented to Y-direction) **planar array** placed in the x-y plane with $d_x = d_y = \lambda/2$ and having the main lobe oriented towards $(\theta_o = 0^0 \ and \ \phi_o = 60^0)$ Plot the array factor as well as the total field pattern in the Z-X, Z-Y and Y-X planes, then estimate the array gain in the x-y plane.

Question (3) (20 Marks)

a- Write down an expression for the array factor of a circular array placed in the X-Y plane.. then, Estimate the **8 elements** phases(α_n) required to orient the main lobe to $(\theta_o = 0^0 \ and \ \phi_o = 90^0)$ if the radius of the array is 3λ .

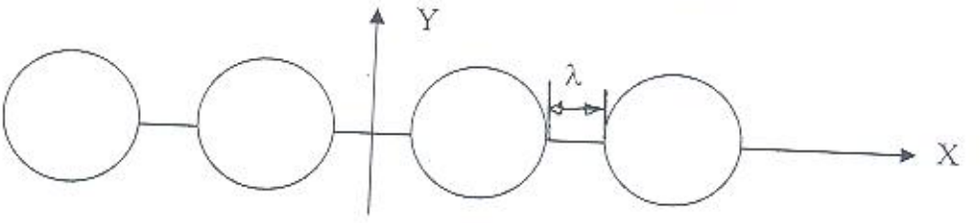
b- Sketch the principal pattern for a uniform feeding **8 elements** broadside circular array with a radius of 4λ in the x-y plane where the elements are short dipoles oriented towards Z-axis.

P.T.O

b- The shown arrangement represents a broadside array that consists of 4 uniformly illuminated circular apertures **each with radius** 1.5λ and the E- field is in Y- direction:

i- Estimate the gain and the 3-dB beam width of each element.

ii- Find and sketch the total field pattern in both E and H planes.



Question (4)

a- **For the micro strip antenna**: (20 Marks)

i- Describe the structure, properties and applications.

ii-Write down a general expression for the far field pattern, gain and radiation conductance assuming thin substrate.

iii- Evaluate the above parameters for a strip width of $w/\lambda = 0.1$ and $w/\lambda = 10$.

b- **For the helical antenna** :

i- Describe the structure, properties and applications of helical antennas

ii- Investigate the differences between the axial and normal modes of operation.

iii-For the axial mode of operation write expression for the radiated pattern as well as the values of the optimum parameters.

iv- Design a 8 turns helical antenna operating at 1.5 GHz in the axial mode with circular polarization. Determine the circumference, the spacing, the axial ratio and pitch angle for near optimum design. Then calculate the input impedance, half-power beam width, directivity and VSWR if the antenna is connected to a 75- ohm coaxial line.

c- Determine and sketch the patterns of a vertically and horizontally polarized short dipoles placed at a height of 2 λ above ground.

"رب اشرح لي صدري ويسر لي أمري"

Dr. Abdel-Fattah A. Abu-Hashem

ع الفصل الدراسي الأول

Department : Electronics& Communications

Tanta University — Total Marks : Marks — Faculty of Engineering

Course Title : Antennas Design — Course Code : EEC4104 — Year : 4th

Date : February 1st (Academic Year 2009/2010 First Term) — Allowed time: 3 hrs — No: of pages : (2)

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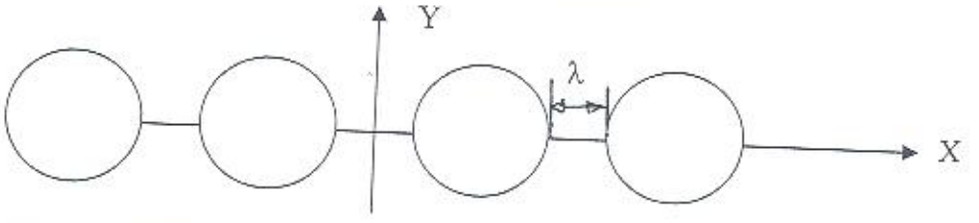

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iv- Design a 8 turns helical antenna operating at 1.5 GHz in the axial mode with circular polarization. Determine the circumference, the spacing, the axial ratio and pitch angle for near optimum design. Then calculate the input impedance, half-power beam width, directivity and VSWR if the antenna is connected to a 75- ohm coaxial line.

c- Determine and sketch the patterns of a vertically and horizontally polarized short dipoles placed at a height of 2 λ above ground.

" ربي اشرح لي صدري ويسر لي امري"

Dr. Abdel-Fattah A. Abu-Hashem

ع / الهلالات حدية ا/ك

Department : Electronics& Communications

Tanta University — Total Marks : 90 Marks — Faculty of Engineering

Course Title : Wave Propagation and Antennas 2 Course Code : EEC412 Year : 4th
Date : February 1st (Academic Year 2009/2010 First Term) Allowed time: 3 hrs No: of pages : (2)

Attempt all questions:

Question (1)

a- Write down **short notes** about: (25 Marks)
i- The main types of antennas. ii- Advantages of planar arrays over linear arrays.
iii- Objectives achieved by the antenna arrays.

b- **For the** linear uniform **H .W.W.E.F array** consisting of N elements :
i- Write down an expression for the array factor.
ii- Derive the needed condition to avoid the presence of grating lobes.
iii- Evaluate its peak-side lobe to main lobe ratio.
iv-Estimate the array directivity and beam width considering isotropic elements .

c- Design a linear uniform **H .W.W.E.F array** such that no grating lobes exist in the resultant pattern and the peak-side lobe to main lobe ratio is less than - **8.73 dB** with minimum number of elements and maximum spacing. Plot the corresponding array factor and approximately estimate the beam width. If the array is along the X-axis and the elements are short dipoles oriented to Z- direction. Plot the resultant pattern in the X-Y, X-Z and Y-Z planes **and estimate the array gain in each plane.**

Question (2)

a- Write down an expression for the array factor of the **non-uniform linear array** with symmetric feeding in the case of **odd number of elements.** (25 Marks)

b- For a **9 elements Binomial end fire array** consisting of short dipoles placed on Y-axis that oriented towards the Z-direction and separated by $\lambda/2$ spacing:
i- Estimate the elements relative feeding coefficients
ii- Plot the array factor as well as the total field pattern in the Z-X and Y-X planes.

c- For a 7 elements **Tcheby-Chave broad side array** consisting of short dipoles placed on Z-axis that oriented towards the Z-direction and separated by $\lambda/2$ spacing, plot the total field pattern in the Z-X and Y-X planes.

d- For a **8x6 elements** (short dipoles oriented to Y-direction) **planar array** placed in the x-y plane with $d_x = d_y = \lambda/2$ and having the main lobe oriented towards $(\theta_o = 0^0 \text{ and } \phi_0 = 60^0)$ Plot the array factor as well as the total field pattern in the Z-X, Z-Y and Y-X planes, then estimate the array gain in the x-y plane.

Question (3)

a- **(1)** Write down an expression for the array factor of a circular array placed in the X-Y plane.. (20 Marks)
then, Estimate the **8 elements** phases(α_n) required to orient the main lobe to $(\theta_o = 30^0 \text{ and } \phi_0 = 60^0)$ if the radius of the array is 3λ .

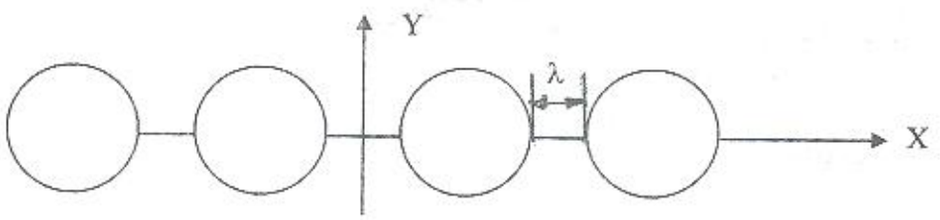
(2) Sketch the principal pattern for a uniform feeding **8 elements** broadside circular array with a radius of 4λ in the x-y plane where the elements are short dipoles oriented towards Z-axis.

P.T.O

b- The shown arrangement represents a broadside array that consists of 4 uniformly illuminated circular apertures **each with radius** 2λ and the E- field is in Y- direction:

i- Estimate the gain and the 3-dB beam width of each element.

ii- Find and sketch the total field pattern in both E and H planes.



Question (4) (20 Marks)

a- **For the micro strip antenna**:

i- Describe the structure, properties and applications.

ii-Write down a general expression for the far field pattern, gain and radiation conductance assuming thin substrate.

iii- Evaluate the above parameters for a strip width of $w/\lambda = 0.1$ and $w/\lambda = 10$.

b- **For the helical antenna** :

i- Describe the structure, properties and applications of helical antennas

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c- Determine and sketch the pattern of a vertically polarized radar antenna placed at a height of 1.5 λ above ground considering the antenna to have a **side lobe free pencil beam pattern** of 2^0 beam width and directed to 30^0 w.r.t ground.

"ربي اشرح لي صدري ويسر لي أمري"

Dr. Abdel-Fattah A. Abu-Hashem

اتصالات مدني ١/ ٢

Department : Electronics& Communications

Tanta University — Total Marks : 90 Marks — Faculty of Engineering

Course Title : Wave Propagation and Antennas 2 Course Code : EEC412 Year : 4th
Date : February 1st (Academic Year 2009/2010 First Term) Allowed time: 3 hrs No: of pages : (2)

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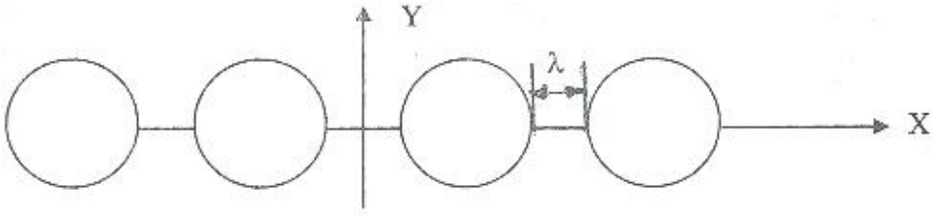

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"ربي اشرح لي صدري ويسر لي أمري"

Dr. Abdel-Fattah A. Abu-Hashem

١/٣٠ ارهالات صديث

Tanta University

Department: Computers and Auto. Control Engineering
Total Marks: **70 Marks**

Faculty of Engineering

Course Title: مقرر اختياري خارج التخصص (٢)(النمذجة و المحاكاة)
Date: Jan 30th 2010 (First term)

Course Code: CCE3152
Allowed time: 3 hrs

Year: 4th (Communications)
No. of Pages: (2)

Remarks: (Attempt **ALL** the following problems and assume any missing data)

Problem number (1) **[18 Marks]**

a) For a **single** non-linear adaptive Perceptron, derive the gradient-descent training algorithm that can be used for the general function approximation problem. Suggest a suitable nonlinear activation function. What condition must this activation function hold? **[10 Marks]**

b)

I) Draw a sketch of a Biological Neuron showing its main parts,

II) Hence, draw the corresponding labelled artificial McCulloch-Pitts model.

III) What do the following terms mean? (Please give **short notes** about their functions).

i. Dendrites,
ii. Soma,
iii. Action potential,
iv. Synaptic junction,

[5 Marks]

c) For some systems, the Mean Squared Error (MSE) has many local minima but only one global minimum.

I) Discuss this statement.

II) When does this case happen? Explain with the aid of graphs. **[3 Marks]**

Problem number (2) **[16 Marks]**

a)

I) Derive the algorithm to find the weights vector for a **linear** Artificial Neural Network (ANN) that minimizes the Mean-Squared-Errors (MSE) when the inputs and output vectors (measurements) are available. **[7 Marks]**

II) What condition must hold for this to be a valid solution? **[1 Marks]**

b)

I) Is it possible to model the logical Exclusive-OR function of two inputs with only one Perceptron? Why? **[2 Marks]**

II) Depending on your answer, design a two-input XOR function. **[6 Marks]**

P.T.O.

Problem number (3) **[18 Marks]**

a) A system output was collected using a noisy sensor that adds a noise to the true output according to the function $h = y + 0.1(-1)^t$; $t \geq 0$, where h, y, and t are the sensor output, system true output, and the time, respectively. However, it is assumed that the system output has to follow the relation $y = -5e^{-0.25t}$; $t \geq 0$. It is required to model the system by approximating its output to be linear in the region $0 \leq t \leq 4$. If only the first five (5) samples, with 1 Hz sampling frequency, are available, find the system model using your knowledge about the ANN. **[8 Marks]**

b) Design an ANN to model the logical AND function of two inputs. **[5 Marks]**

c) According to your answer in part (b), design an electronic circuit to implement the AND function by finding the values of the resistors if the amplitude of the power supply voltage, Us, is 6 volts. **[5 Marks]**

Problem number (4) **[18 Marks]**

a) Draw and label a multi-layer Perceptron with a single hidden layer and a single output unit. Then, **only** write down (**without proof**) the training algorithm for both output and hidden layers. **[2 Marks]**

b) Verify that the derivative of the sigmoidal function of an input, u, and an output, y, can be expressed in terms of its own output thus: $\frac{dy}{du} = y(1-y)$. **[2 Marks]**

c) A three-input single-output system is governed by the equation $z = a\,x_1 + bx_2 + cx_3$, where x_1, x_2, and x_3 are the inputs; a, b, and c are constant coefficients; and z is the model output. Train to find the instrument model using steepest descent algorithm with learning rate of 0.6, and the samples to the inputs, the output, and the initial weights are $\begin{bmatrix} 0 & 1 & 2 \\ 0 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}^T$, $[2 \quad 1 \quad 3]^T$, and $[2 \quad 1 \quad -2]^T$, respectively.

. Train the ANN using:

I) Batch-training algorithm **(Calculate for only <u>two</u> epochs).** **[7 Marks]**

II) Online-training algorithm **(Calculate for only <u>one</u> epoch).** **[7 Marks]**

—(With Best Wishes)—

Course Examination Committee

Dr. Ahmed Nassef

الاتصالات قديم ١/٣٠

Tanta University

Department: Computers and Auto. Control Engineering
Total Marks: **70 Marks**

Faculty of Engineering

Course Title: مقرر اختياري خارج التخصص (٢)(النمذجة و المحاكاة) | Course Code: CCE3152 | Year: 4th (Communications)
Date: Jan 30th 2010 (First term) | Allowed time: 3 hrs | No. of Pages: (2)

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---(With Best Wishes)---

Course Examination Committee

Dr. Ahmed Nassef

امتحان جديد

Tanta University | Department: Elect. & electrical communications | Faculty of Engineering

Total Marks: 125 Marks

Course Title: Satellite Communications System | Course Code: EEC 411 | Year: Fourth

Date: 27/1/2010 | Allowed Time: 3 Hours | No. of pages: 2

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

Problem number (1) **(25 Marks)**

Choose the correct answer (write the answer only): (5 Marks for each point)

1- A power-conditioning unit is needed in the power subsystem for ……..
a- control of battery charging b- power regulation c- a&b
2- Solar cells in three-axis stabilized satellites are utilized …… that of the spin stabilized
a- better than b- less than c- other answer
3- Eclipses occur for a GSO satellites …….. a year
a- three-times b- two-times c- unlimited number of times
4- NiH_2 batteries provide significant improvement in …..
a- power-to-weight-ratio b- weight-to-power ratio c- other answer
5- The power generating and control systems on the communications satellite account for
a- small part of its weight b- large part of its weight c- negligible part of its weight

Problem number (2) **(25 Marks)**

a) What are the advantages of satellite communications? (5 Marks)

b) Describe with sketches the block diagram of FT satellites? (10 Marks)

c) Deduce an expression for the composite carrier-to-noise power spectral density for FT satellites? (10 Marks)

Problem number (3) **(25 Marks)**

a) An FSS ground terminal located in Chicago at latitude of 41.5° N and 87.6° W has access to two GSO satellites, one stationed at 70° W longitude and the second at 135° W longitude. Which satellite will provide the more reliable link for the ground terminal? The ground terminal elevation above sea is 890 m. (8 Marks)

b) A typical parameters for VSAT uplink network is as follows: the transmit power is 20 watts and both the transmit and receive parabolic antennas have a diameter of 3m. The antenna efficiency is 55% for both antennas. The satellite is in a GSO location, with a range of 35900 km. The frequency of operation is 10 GHz. Determine the received power and the power flux density for the link. (9 Marks)

c) For binary FSK link, deduce an expression for the $(e_b/n_o)_t$ for OBP satellite? (8 Marks)

P.T.O

Problem number (4) **(20 Marks)**

	Uplink	*Downlink*
Frequency (GHz)	14	12
Noise Bandwidth (MHz)	25	25
Transmit RF Power (watts)	100	20
Transmit Antenna Gain (dBi)	55	38
Free Space Path Loss (dB)	207	206
Total Atmospheric Path Loss (dB)	A_U	A_D
Mean Path Temperature (K)	290	270
Receive Antenna Gain (dBi)	37.5	52.5
Receiver Antenna Temperature (K)	290	50
Receiver Noise Figure (dB)	4	3

Consider a satellite link with the following uplink and downlink parameters. All other losses can be neglected. *Include the noise contribution from the atmospheric path loss in all calculations.*

a) What is the composite carrier-to-noise ratio (C/N) for the link for $A_U = 5$ dB and $A_D = 0$ dB. (7 Marks)

b) Assume the link requires a 15 dB composite C/N to operate. If $A_D = 0$ dB, what would be the maximum value of A_U that could occur and maintain the composite C/N $\geq$ 15 dB (8 Marks)

c) Is this link uplink or downlink limited? (5 Marks)

Problem number (5) **(30 Marks)**

Complete the following sentences (write the answer only): (2 Marks for each point)

a) Antenna losses are absorptive losses produced by the physical structure such as
1- ....., 2- ....., 3- .....

b) In OBP satellites both uplinks and downlinks are .....

c) Some of the first generation systems of OBP satellites are
1- ....., 2- ....., 3- .....

d) Some of the first generation systems of FT satellites are
2- ....., 2- ....., 3- .....

e) The communications satellite subsystems include
1- ....., 2- ....., 3- ..... 4- ....., 5- .....

With Best Wishes