Tanta University
Faculty of Engineering
Electrical Power and Machines Engineering Dept.

Final Exam – First Semester 2018-2019

Course: EPM2104/EPM2141(Electromagnetic Fields)	**Time allowed:** 3 hr.
Year: 2nd Electrical Power/Communications	**Date:** 16 Jan 2018
No. of Pages: 2 — **No. of Questions:** 5	**Total Score:** 85

Remarks: Attempt to solve all of the following questions

Part-I Electrostatic Fields

Question 1 — 20 Points (10, 10)

[A] Consider a distribution of three charges in free space consisting of
- A point charge $Q = 250\pi\varepsilon_o$ C at (6,8,4),
- A uniform line charge density $\rho_L = 20\pi\varepsilon_o$ C/m at $x = 0, z = -1$ and
- A uniform surface charge density $\rho_s = 4\varepsilon_o$ C/m^2 at $z = 0$.

Find:
(a) the total electric flux leaving a sphere of diameter 10 m centered at the origin.
(b) the total electric flux density at point $A(0,0,4)$.
(c) the force on a point charge q of $1\mu C$ placed on point A.
(d) the potential difference between the points $A(0,0,4)$ and $B(0,0,-4)$.
(e) the work done in moving the charge q from point-A to point-B.

[B] A radial electric field distribution in free space is given in spherical coordinates as:

$$E_r = \begin{cases} \dfrac{r\rho_o}{3\epsilon_o} & r \le a \\ \dfrac{2a^3 - r^3}{3\epsilon_o r^2}\rho_o & a \le r \le b \\ \dfrac{2a^3 - b^3}{3\epsilon_o r^2}\rho_o & r \ge b \end{cases}$$

where ρ_o, a, and b are constants, here $b > a$.

(a) Sketch the magnitude of electric field strength against r. Then, determine the volume charge density in everywhere.
(b) In terms of given parameters, find the total charge, Q_{tot}, within a sphere of radius r where $r > b$.
(c) Find the potential difference between a and b.

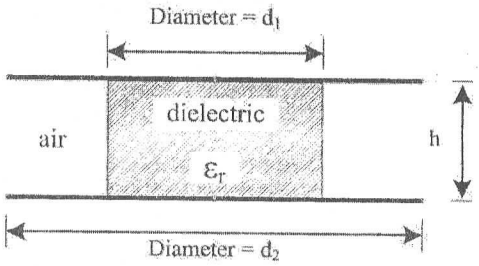
Question 2 — 15 Points (5, 10)

[A] A hollow tube with a rectangular cross section has external dimensions of 0.5 cm by 1 cm and a wall thickness of 0.05 cm. Assume that the material is brass, for which $\sigma = 1.5 \times 10^7$ S/m. A current of 200 A dc is flowing down the tube.

(a) What voltage drop is present across a 1 m length of the tube?
(b) Find the voltage drop if the interior of the tube is filled with a conducting material for which $\sigma = 1.5 \times 10^5$ S/m.

[B] The surface $x = 0$ separates two perfect dielectrics. For $x > 0$, let $\epsilon_{r1} = 3$, while $\epsilon_{r2} = 5$ where $x < 0$. If $\bar{E}_1 = 80\hat{a}_x - 60\hat{a}_y - 30\hat{a}_z$ V/m, find:

(a) E_{N1}; (b) E_{T1}; (c) $|E_1|$; (d) the angle θ_1 between E_1 and a normal to the surface;
(e) D_{N2}; (f) D_{T2}; (g) $\bar{D}_2$; (h) the angle θ_2 between E_2 and a normal to the surface;
(i) the electrostatic energy density in both regions;
(j) the total energy stored in a cube of side 4 m centered at the origin.

Question 3		10 Points
[A]	**For the capacitor shown in the Figure.** a) Find the expression of the capacitance. b) After connecting a dc voltage source with a voltage magnitude V_o across the capacitor terminals, calculate E, D, Q, and the total energy stored in the capacitor.  c) With the source still connected, the dielectric is carefully withdrawn from between the plates. With the dielectric gone, recalculate E, D, Q, and the energy stored. d) If the charge and energy found in part (c) are less than the values found in part (b) (which you should have discovered), what became of the missing charge and energy?	

Part-II Magnetostatic Fields and Time varying fields		
Question 5		**20 Points**
[A]	Write down Maxwell equations for steady magnetic field and static electrical field in both differential and integral forms. Explain the modifications required for time varying fields.	
[B]	An electron with velocity $\bar{u} = (3\hat{a}_x + 12\hat{a}_y - 4\hat{a}_z) \times 10^5$ m/s in a magnetic field $\bar{B} = 10\hat{a}_x + 20\hat{a}_y + 30\hat{a}_z$ mWb/m^2 (Electron charge e=1.6×10-19). Find $\bar{E}$ such that the velocity of the particle remains constant.	
[C]	For a rectangle loop laying in xy plan, the loop opposite corners are (0,0,0) and (1,2,0). It carries a filamentary current of 4mA. The current is going out the origin along x-direction. If the loop is subjected to the magnetic field $\bar{B}_o = -0.6\hat{a}_y + 0.8\hat{a}_z$ Tesla, calculate the torque established on the loop.	

Question 5		20 Points
[A]	Express the value of $\bar{H}$ in Cartesian components at P(0.01,0, 0)m in the field of coaxial cable $a = 3$ mm, $b = 9$ mm, $c = 12$ mm, $I = 0.8$ A, centered on the z-axis, the $\hat{a}_z$ direction is into the central conductor.	
[B]	A current sheet, K = **6.0**ax A/m, lies in the z=0 plane and a current filament is located at y=0, z=4m. Determine the filament current I and its directions, if H=0 at (0, 0, 1.5) m.	
[C]	The point charge $Q = 18$ nC has a velocity of 5×10^6 m/s in the direction $\bar{a}_v = 0.6\hat{a}_x + 0.75\hat{a}_y + 0.3\hat{a}_z$. Calculate the magnitude of the force exerted on the charge by the following fields together. a) $\bar{B} = -3\hat{a}_x + 4\hat{a}_y + 6\hat{a}_z$ mT b) $\bar{E} = -3\hat{a}_x + 4\hat{a}_y + 6\hat{a}_z$ kV/m	

$\nabla.\bar{A} = \frac{1}{\rho}\frac{\partial(\rho A_\rho)}{\partial\rho} + \frac{1}{\rho}\frac{\partial A_\phi}{\partial\phi} + \frac{\partial A_z}{\partial z}$	$\nabla.\bar{A} = \frac{1}{r^2}\frac{\partial(r^2 A_r)}{\partial r} + \frac{1}{r\sin\theta}\frac{\partial(\sin\theta\, A_\theta)}{\partial\theta} + \frac{1}{r\sin\theta}\frac{\partial(A_\phi)}{\partial\phi}$

Wish you all the best **A. Prof. Mohamed K. El-nemr** and **Dr. Sherif Dabour**

Tanta University | Department: Electronics and Communications Eng. | Faculty of Engineering

تانية اضافات

Course Title: Technical Reports	Course Code: EEC21H3	Second Year
Date: 21/01/2019	Allowed time: 2 hr	No. of Pages: (1)

Answer the following Questions:

1. **A) What are the main contents of the reports' body?**

   B) Define the word 'citation'. Then, order and write the following references' information using the APA and the MLA formats:

   'pp.2-9, International Journal of Advanced Computer Science and Applications, LPA beamformer for tracking nonstationary accelerated near-field sources, 2014, vol. 5, Ashour, A..'

   'pp.1-12, International Journal of Computer Network and Information Security, MUSIC 2D-DOA estimation using split vertical linear and circular arrays, 2013, vol. 5, Albagory, Y., Ashour, A..'

2. **A) Compare between the informal and formal reports?**

   B) Mention the different types of the technical writing.

3. **A) What are the main contents of the title page with an example?**

   B) Give examples for the Tree Diagram for effective writing with explanation?

4. **A) Structure the Table of contents for a review article titled 'Embedded systems Applications'. Then, write an abstract of this title.**

   B) Reorder and re-write the following abstract contents, then, mention the restrictions (what to avoid) while writing an abstract?

Title: **Smart GSM based Home Automation System**

Unordered abstract:

The proposed prototype of GSM based home automation system was implemented and tested with maximum of four loads and shows the accuracy of ≥98%. The analysis and implementation of the home automation technology using Global System for Mobile Communication (GSM) modem to control home appliances such as light, conditional system, and security system via Short Message Service (SMS) text messages is presented in this paper. The proposed research work is focused on functionality of the GSM protocol, which allows the user to control the target system away from residential using the frequency bandwidths. The concept of serial communication and AT-commands has been applied towards development of the smart GSM-based home automation system. Home owners will be able to receive feedback status of any home appliances under control whether switched on or off remotely from their mobile phones. PIC16F887 microcontroller with the integration of GSM provides the smart automated house system with the desired baud rate of 9600 bps. This research work investigates the potential of 'Full Home Control', which is the aim of the Home Automation Systems in near future.

5. **A) Define the word 'APPENDIX' and when it can be used? Then, address the general guidelines for Graphs and Tables.**

   B) Mention the different resources for writing a report.

Best Wishes==Dr. Amira Salah Ashour

ثانية اتصالات
٢٠١٩/١/٢٣

Tanta University

Department of Physics&Mathematics

Faculty of Engineering

Tanta University Faculty of Engineering	Jan.2019 PME2110(85M) Second year (2nd com.) No. of Pages: (2)

Q (1) (28M)

(a) Find the root of equation $e^{2x} + x - 2 = 0$ by use the following methods

(i) Secant method

(iii) Lagrange method

(b) From directional encoding for digital image of curve starting at (0,0) and represent by the sequence of codes 7770 .

(i)Represent these codes graphically in xy-plane.

(ii) From its Coordinate find cubic spline interpolation form

Use $S_i(x) = a_i(x - x_i)^3 + b_i(x - x_i)^2 + c_i x - x_i) + d_i$

$a_i = \frac{M_{i+1} - M_i}{6h}$, $b_i = \frac{M_i}{2}$, $c_i = \frac{y_{i+1} - y_i}{h} - \left(\frac{M_{i+1} + 2M_i}{6}\right)h$, $d_i = y_i$, i=1,2,…,n-2

$M_i + 4M_{i+1} + M_{i+2} = \frac{6}{h^2}(y_i - 2y_{i+1} + y_{i+2})$, $M_0 = 0$ and $M_n = 0$

(c) Let Δ and ∇ be forward and backward operators. Show that

$$(1 + 2^{-h})^{-2}\nabla^2 2^x = (1 + 2^h)^{-2}\Delta^2 2^x$$

Q (2) (28M)

(a) From the following table find f(0.11) , f(.65) and f(0.35) (use Gauss and Newton)

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7
f(x)	5	3	4	7	5	6	4

(b)Deduce the form of Newton's divided difference low where

$$F[x_{i+1}, x_i] = \frac{y_{i+1} - y_i}{x_{i+1} - x_i} \quad \text{and} \quad F[x_{i+2}, x_{i+1}, x_i] = \frac{F[x_{i+2}, x_{i+1}] - F[x_{i+1}, x_i]}{x_{i+2} - x_i}$$

(c)From the following table find (use Gauss and Newton)

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
f(x)	5	3	4	7	5	6	4	10

(i) $D_{3,3}$ (Ricardson extrapolation) where $D_{11} = f'(0.5)$.

(ii) , f '(0.8) , f '(0.35) and f ''(0.5)

(iii) f '(0.11)

Q (3) (29M

(a) Deduce the recurrence form of Ricardson extrapolation formula

$$D_{n,m+1} = \frac{4^m}{4^m - 1} D_{n,m} - \frac{1}{4^m - 1} D_{n-1,m}$$

Where $D_{1,1} = a(h) = f'(x)$ and $D_{n,1} = a\left(\frac{h}{2^{n-1}}\right)$

(b) Use Shooting method to find y(0.6) , h=$\frac{1}{3}$ and $0 \leq x \leq 1$ for

$$y'' + xy' + y = x^2$$

where $y(0) = 0$ and $y'(1) = 1$

(c) Deduce finite difference form of one dimension wave equation and use it to find the deflection of vibrating string $u_{tt} = 9\, u_{xx}$, with boundary and intial conditions u(x,0)=x (1-x) , u_t(x,0)=1 u(0,t)=1 , u(1,t)=0 , and $0 \leq x \leq 1$

Tanta University

Department: Electronics and Electrical Communication Eng.
Total Marks: 90 Marks

Faculty of Engineering

Course Title: Electronic Circuits (1)	**Course Code: EEC 2103**	**Year: 2nd**
Date: 19/1/2019	**Allowed time: 3 hours**	**No. of Pages: (3)**

Remarks: (attempt to answer all the following questions ... assume any missing data ... answers should be supported by sketches)

Question (1) *(20 degrees)*

Write only the missing words, or the chosen words in your answer.

(a) The larger the level of load resistance, the ..... is the level of ac gain, whereas the smaller the internal resistance of the signal source, the ..... is the overall gain.
(b) Darlington amplifiers have ..... input impedance, ... output impedance, very ..... current gain, and voltage gain .....
(c) ....., and ..... are the basic requirements for any power amplifier.
(d) The major classifications for oscillators are ..... and, ...
(e) For linear amplification, distortion is .....
(f) The efficiency of Class-A power amplifier can be increased to reach .....
(g) The dc operating point should be ..... to achieve maximum power.
(h) The conversion efficiency is defined as .....
(i) The quality factor of tuned circuit is inversely proportional to .....
(j) One way of achieving sustained oscillations is .....
(k) Oscillation is defined as .....
(l) Advantages of tuned amplifiers are ....., and .....
(m) Impedance of tuned circuit is ..... at resonant frequency.
(n) Common-mode rejection ratio is defined as .....
(o) Negative feedback has several advantages of ....., ..., and .....
(p) Twin-T oscillator acts as .....
(q) The impedance of the crystal is ..... at the series resonant frequency, thus providing ..... feedback.
(r) A great advantage of the crystal oscillator is .....
(s) The 555 timer consists of ....., ..., ..., and .....
(t) ....., ... and ..... are examples of LC oscillators.
(u) Types of multivibrators are ....., ..., and .....
(v) Figure of merit is defined as .....
(w) Class AB amplifiers eliminates ..... found in class B.

Question (2) *[22 degrees]*

(a) For class-A power amplifier, prove an expression for the ac output power P_{ac}, and the maximum efficiency η_{max}.

(b) For class-B power amplifier, prove an expression for the average power dissipation P_D, and the minimum efficiency η_{min}.

(c) For a class B amplifier providing a 20V peak signal to a $16\,\Omega$ load (speaker) and a power supply of $V_{CC}=30\,V$, determine the input power, output power, circuit efficiency, maximum input power, maximum output power, and maximum transistor dissipation.

Question (3) [23 degrees]

(a) For the circuit shown in Figure 1. Find the following:

i. I_1, I_2, I_3, I_L and V_X.

ii. If V_o has a minimum value of (-13 volt), find the maximum allowed value of R_L.

iii. If R_L is varied in the range of 100 Ω to 1 kΩ, what is the corresponding change in I_L and in V_O.

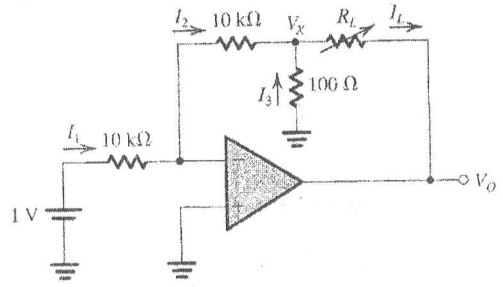


Figure 1

(b) For an operational amplifier in Figure 2, prove an expression for V_o in terms of V_1, consider a practical op-amp ($R_{in} = \infty$, $R_o = 0$, and $A_{o.l} \neq \infty$).

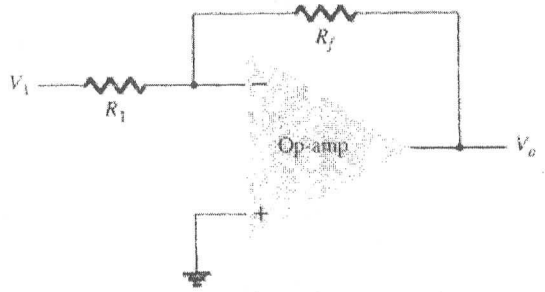


Figure 2

Question (4) [25 degrees]

(a) For voltage–shunt feedback; prove an expression for the feedback voltage gain.

(b) For voltage–series feedback; prove an expression for the input impedance, and output impedance.

(c) Calculate the gain with and without feedback for an amplifier as in Figure 3, for circuit values $R_1 = 800\,k\Omega$, $R_2 = 200\,\Omega$, FET $R_o = 40\,k\Omega$, $R_D = 3\,k\Omega$, and $gm = 5000\,\mu S$.

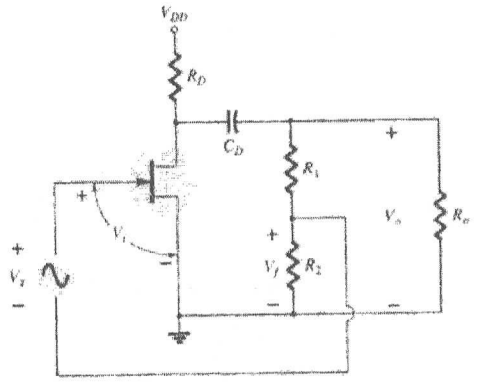


Figure 3

(d) For the circuit shown in Figure 4,

i. Determine, the closed loop gain, and resonant frequency.

ii. Find conditions for start-up and sustained oscillation.

iii. Sketch a practical circuit for self-starting.

[Hint: using $R_3 = R_4$, $C_1 = C_2$].

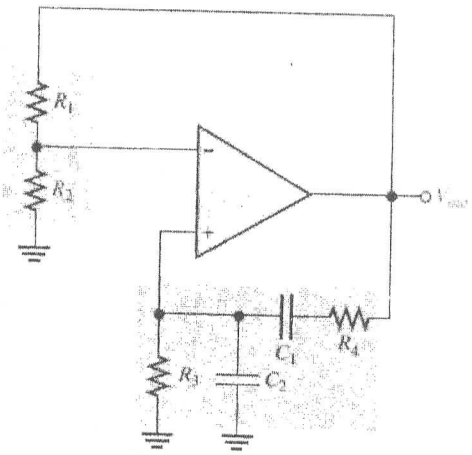


Figure 4

Best Wishes of Success

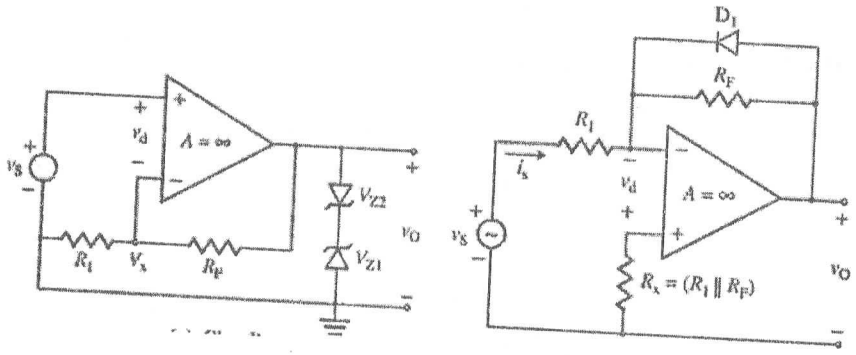
Dr. Heba A. El-Khobby

Tanta University	Department of Electronics and Electrical Communication Engineering	Faculty of Engineering
Course Title: **Electronic Measurements (1)**	Course Code:EEC2105,	Students: **2nd year.**
Date: **Sat.,12-Jan.-2019,**	Time Allowed: **3 hours,**	No. of Pages: **2**
	Total Marks: **90**	
	Final Exam	

Remarks: (answer the following questions… assume any missing data … arrange your answer booklet … Use graphs and examples whenever you have a chance during your answer)

Question 1: *(20 Marks)*

a- What is the purpose and input/output transfer characteristics for the circuits shown?



b- Design a second order active band pass filter with voltage gain of 10 and a lower cut-off frequency of 1 KHz and higher cut-off frequency of 5 KHz. Draw the circuit and sketch its frequency response.

c- Draw a precision instrumentation full wave rectifier and indicate how it works. If the input signal is $v_I = 2 \sin \omega t \ \ V$, compare its output to a bridge full wave rectifier.

d- A non-inverting Schmitt trigger has $|V_{LT}| = |V_{HT}| = 3V$ and $|V_{sat}| = 12V$. Draw its circuit and find the values of resistances required.

Question 2: *(20 Marks)*

a- Draw the basic structure of the LVDT. Show how it measure the displacement. List the advantages of it.

b- Compare the different temperature transducers. Put your answers in a table.

c- A thermometer transducer has a coefficient of 0.00522, if its resistance is 500Ω at 0°C. What should the temperature of a liquid if its resistance is 1240 Ω?

d- A strip of a conductor of width 2 mm is exposed to an unknown magnetic field while a current of 1.6 A is flowing into it. the Hall voltage induced is 15 mV. Since the Hall coefficient is unknown,

the user changed the current to $1\ A$. The voltage is changed to $5.2\ mV$. What is the value of the field and the Hall coefficient?

Question 3: *(15 Marks)*

a- A digital signal is presented by $10V$ for logic 1 and $-10V$ for logic 0. Construct a 4-bits summing type DAC and a 4-bit R-2R ladder DAC using 10 KΩ resistors. Find the output of each circuit for a digital input: 1111, 0010.

b- Compare the ramp type ADC, the flash ADC and the dual slope ADC. Deduce which ADC type is suitable for digital video transmission.

Question 4: *(20 Marks)*

a- Draw a circuit for generating square/triangle waveforms test signals for laboratory.

b- Draw a stabilized Wien bridge oscillator based on OpAmp that has all the resistors in the feedback network are set to $22\ K\Omega$ and all capacitances are set to $2.2\mu F$. Find: (i) the frequency of oscillation, (ii) the condition for oscillation, (iii) If the available resistors for adjusting the gain of the amplifier are $15\ K\Omega, 33\ K\Omega, 220$ KΩ and $470\ K\Omega$, choose the right values for assuring the existence of oscillation.

c- A Colpitts oscillator has $C_1 = 25C_2$, $L = 10nH$. Draw the circuit and find C_1, C_2 for generating a frequency of $0.9\ MHz$ and the required amplifier gain.

d- Draw two different circuits for crystal oscillators.

Question 5: *(15 Marks)*

a- With the aid of block diagrams, compare between the heterodyne-based wave analyzers and window-type wave analyzers.

b- A wave analyzer can observe up to the sixth harmonic. If the expected input signal has a fundamental frequency of $0.1\ KHz$. What must be the bandwidth of its filter that can allow change in frequency of 5% of the fundamental?

c- A distortion analyzer is used for testing an amplifier. It reported that the THD of a signal is 15% and it contains only the fundamental, 1^{st} , 5^{rd}, 10^{th} and 15^{th} harmonics. If the *rms* value of the harmonics are $1.2V, 0.24V, 0.12V, 0.051V$ respectively. Find the rms value of the fundamental frequency. Suggest a method to reduce the THD of that amplifier.

The end of questions

Use only black or blue pens or pencils in your answer
Do not make any mark in your booklet

Good luck

Dr. Sameh A. Napoleon (Coordinator of the Course)

Electronics and Electrical Communications Engineeing Dept.

Final Exam: Total 100 Marks

Tanta University **Faculty of Engineering**

Course Title: Communication Theory	Course Code: EEC 2104	Year: 2nd
Date: First Term 9/1/ 2019	Allowed Time: 3 Hours	No. of Pages: (2)

Answer the following Questions

Question No 1 [25 Marks]

a. Define, draw, and write the standard mathematical expression of the following signals in time domain including their symbols and specifications. [5 Marks]

عرف وارسم واكتب الصيغ الرياضية القياسية للإشارات التالية في تمثيلها الزمني مع توضيح رموزها ومواصفاتها.

a. Unit step function دالة خطوة الوحدة
b. One sided exponential function. دالة الأس أحادية الجانب
c. Sampling function. دالة العينات
d. Lorenz function. دالة لورنز
e. Gaussian Function. دالة جاوس

b. Write down the mathematical relations that illustrate the properties of Delta signal indicating its importance in mathematics, then write the possible expressions that could represent it. [5 Marks]

أكتب العلاقات الرياضية التي توضح خصائص إشارة النبضة موضحا أهميتها في الرياضيات ثم اكتب الصيغ الممكنة لتمثيلها رياضيا.

c. Prove in details the procedure of developing of the exponential Fourier expansion to yield the Fourier transform pair, and illustrate the importance of both representations. [5 Marks]

برهن بالتفصيل خطوات تطوير امتداد فوريير الأسي للحصول إلى زوج تكاملات تحويل فوريير. ثم وضح أهمية كلا منهما.

d. Given the standard Fourier transform: $e^{-|t|} \leftrightarrow \frac{2}{1+\omega^2}$, what is the time function corresponding to the spectrum: $\frac{1}{\frac{1}{4}+\frac{\omega^2}{4}}$. [5 Marks]

بمعلومية زوج تحويل فوريير القياسي التالي: $e^{-|t|} \leftrightarrow \frac{2}{1+\omega^2}$ أوجد الدالة الزمنية التي تناظر الطيف التالي: $\frac{1}{\frac{1}{4}+\frac{\omega^2}{4}}$.

e. Summarize the properties of Fourier transform including the following: The name of property, its mathematical expression, its importance, its application or usage. [5 Marks]

قم بتلخيص خصائص تحويل فوريير متضمنا ما يلي: اسم الخاصية، تعبيرها الرياضي، أهميتها، وتطبيقاتها أو استخداماتها.

Question No 2 [25 Marks]

a. Identify both of the energy spectral density and power spectral density while indicating the mathematical expressions that relates them to the energy or power. [5 Marks]

عرف كل من الكثافة الطيفية للطاقة والكثافة الطيفية للقدرة مع الإشارة إلى التعبيرات الرياضية التي تربطهما بالطاقة او بالقدرة

b. What are the two mathematical approaches that could be used to obtain the output response of a linear time invariant system? What is your comment? [5 Marks]

ما هما النهجين الرياضيين اللذين يمكن استخدامهما للحصول على استجابة المخرجات للنظام الخطي الغير معتمد على الزمن ؟ وما تعليقك عليهما ؟

c. Define the transfer function indicating its importance, then illustrate various methods that could be used to estimate or to measure it. [5 Marks]

عرف دالة التحويل موضحا أهميتها، ثم اشرح جميع الطرق لتقديرها أو قياسها.

d. Deduce, express and draw the transfer function of an ideal BPF that satisfies the performance of a distortion-less, linear time invariant system, then prove its impulse response. Draw it then comment. [5 Marks]

استنتج وصغ وارسم دالة النقل المثالية لمرشح التردد البيني BPF التي تحقق أداء النظام الخطي الغير متغير مع الزمن مع انعدام التشويه، ثم اثبت استجابة النبضة. وارسمه مع التعليق.

e. Explain how to estimate the bandwidth in both of time and frequency domains, how to analyze LPF concerning 3dB point and maximum power transfer to load and prove how to estimate bandwidth corresponding to the increase of output from 10 to 90% of its final value.[5 Marks]

اشرح بشكل عام كيفية تقدير عرض النطاق الترددي في كل من المجال الزمني والمجال الترددي، وكيفية تحليل LPF فيما يتعلق بنقطة 3dB لنقل الطاقة القصوى للحمل، مع اثبات كيفية تقدير عرض النطاق الترددي المقابل لزيادة الخرج من 10٪ إلى 90٪ من قيمته النهائية.

Question No 3 [25 Marks]

a. Analyze the operation of nonlinear type balanced demodulator to detect the DSB.SC signal. Comment about the condition of using this method.

قم بتحليل تشغيل المعدل المتوازن من النوع الغير خطي لكشف إشارة تعديل السعة بجانبين مع حذف الموجة الحاملة DSB.SC ثم ناقش شرط استخدام هذه الطريقة.

b. Draw and explain the operation of SSB.SC detector using carrier reinsertion. [5 Marks]

ارسم واشرح طريقة تشغيل كاشف تعديل السعة بجانب مع حذف الموجة الحاملة SSB.SC باستخدام إعادة إدراج الموجة الحاملة.

c. Analyze the modulation demodulation processes of VSB system indicating its signal in both time and frequency domains to deduce the characteristics of side filter. [5 Marks]

قم بتحليل عمليتي التعديل واستعادة التعديل لنظام الجانب وآثر VSB مع توضيح صيغة إشارته في كل من التمثيل الزمني والترددي ثم استنتج خصائص مرشح الجانب.

d. Sketch and explain the standard specifications of the transmission bandwidth of TV signal as an application for amplitude and angle modulation techniques. Compare it by the bandwidth required to transmit the video signal using FM of least value of $\beta = 1$. [5 Marks]

ارسم واشرح المواصفات القياسية للنطاق الترددي لإرسال إشارة التلفزيون TV كتطبيق لتقنيات كل من تعديل السعة AM وتعديل الزاوية Angle modulation. وقارنه بعرض النطاق المطلوب لنقل إشارة الفيديو بتعديل التردد بفرض اقل قيمة $\beta = 1$

e. Draw and comment briefly about the block diagram of AM radio receiver then illustrate the super heterodyne concept indicating its importance. [5 Marks]

ارسم وتكلم بايجاز عن المخطط الصندوقي لمستقبل راديو AM ثم اشرح مفهوم المغاير الفوقي الفائق مشيرا إلى أهميته.

Question No 4 [25 Marks]

a. Analyze the wideband PM modulating signal assuming the information as a sinusoidal signal to deduce the mathematical formula for WBPM signal. [5 Marks]

قم بتحليل إشارة تعديل الطور PM ذو النطاق العريض بافتراض إشارة المعلومات جيبية واستنتج الصيغة الرياضية لها.

b. How to indicate the use of Bessel tables to estimate the bandwidth of wideband FM systems proving that it corresponding to Carson rule given as: $BW_{WBFM} = 2(\Delta\omega + 2\omega_m)$. [5 Marks]

كيف يمكنك توضيح استخدام جداول Bessel لتقدير عرض نطاق أنظمة FM ذات النطاق العريض وبرهن على انه يناظر قاعدة كارسون لتحديد النطاق الترددي لتعديل التردد ذو النطاق العريض: $BW_{WBFM} = 2(\Delta\omega + 2\omega_m)$

c. Explain in details the indirect Armstrong method to generate WBFM signal. [5 Marks]

اشرح بالتفصيل طريقة Armstrong غير المباشرة لتوليد إشارة WBFM.

d. The reverse bias PN junction can be used as a modulator to generate the wideband FM signal, explain this method in details. [5 Marks]

يمكن استخدام وصلة PN في الانحياز العكسي كمعدل لتوليد إشارة FM عريضة النطاق، إشرح هذه الطريقة بالتفصيل.

e. What is the main concept of FM detection, then illustrate the operation of Stagger tunable discriminator indicating its advantages over HPF and tuned circuit discriminators. [5 Marks]

ما هو المفهوم الرئيس للكشف عن إشارة تعديل التردد FM، ثم قم بتوضيح تشغيل مميز Stagger القابل للضبط موضحا مزاياه على كل من مميز مرشح التردد العالي HPF ومميز دائرة الرنين.

Best Wishes
Dr. Mahmoud A. A. Ali

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