Electronics and Electrical Comm. Dept.
Total Marks: 90 Marks

Electronic Circuits (1)	Course Code: EEC2103	Year: 2nd
Date: Feb, 3rd 2010 (First Term)	Allowed Time: 3 hrs	No. of Pages: (2)

Answer the following Questions:

Question.1 (18 Marks)

For the amplifier shown in Fig.1, the component values are: (V_{CC}=12V, β=100, R_s= 4KΩ, R_1=8 KΩ, R_2= 4KΩ, R_E= 3.3 KΩ, R_C=6 KΩ, R_L=4 KΩ, C_{C1}= C_{C2}= 1μF, C_E=10μF) and the DC emitter current is found to be $\mathbf{I_E \cong 1mA}$,

a) Study the *low* and *high* frequency responses to determine the dominant low and high cutoff frequencies.
b) Sketch Bode plot
c) Calculate the bandwidth

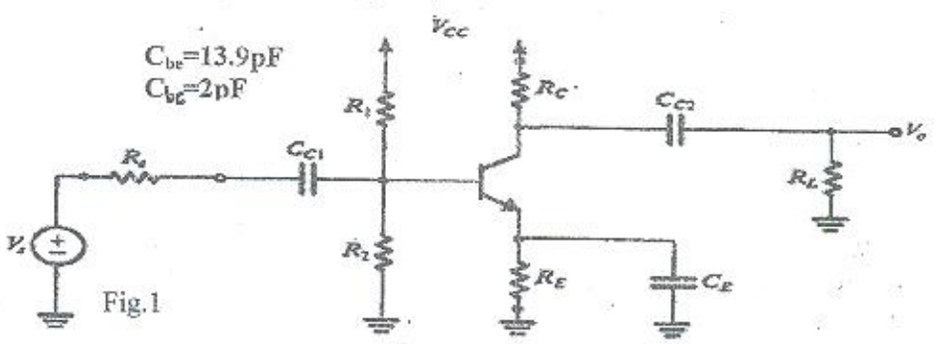
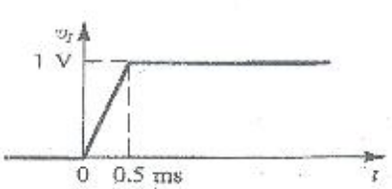


Fig.1

Question.2 (18 Marks)

a) A differential amplifier has R_s=5kΩ, R_L=10KΩ, R_{id}=1MΩ, R_o=75Ω, and A=60dB:
   i) Find the overall voltage gain A_v of the amplifier in dB.
   ii) What is the amplitude of v_s of the sinusoidal input signal needed to develop a $15V_{p-p}$ at the output terminals? (6 Marks)

b) An op amp ***integrator*** with ***1ms*** time constant is driven by the step shown. Assuming V_0 to be zero initially, sketch and label its output waveform. (6 Marks)



c) For the circuit shown in Fig.2, determine v_O in terms of v_1, v_2, v_3. (6 Marks)

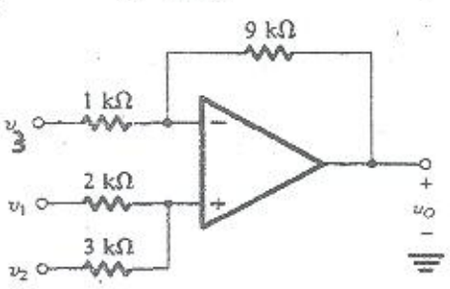


Fig.2

Question.3 (18 Marks)

a) Derive an expression for the finite input resistance of *inverting* amplifier. (8 Marks)

b) An *inverting amplifier* with a gain magnitude of 20 employs an op amp having dc gain of 10^4 and a unity- gain frequency $f_T = 10^6$ Hz. (10 Marks)

i) What is the 3-dB frequency of the open loop amplifier f_c ?

ii) What is the 3-dB frequency of the closed loop amplifier f_{cu} ?

iii) What is the gain at $0.1f_{cu}$? At $10f_{cu}$?

iv) Write down the transfer function of the closed loop amplifier. If two stages of the same inverting amplifier are used, what will be the new frequency f_{cu} '?

Question.4 (16 Marks)

a) For LC filter shown in Fig.4, if L=100mH , C=253nF, and R=360Ω. Find the quality factor and resonant frequency. What is the type of this response? What is its main advantage over the other types? (8 Marks)

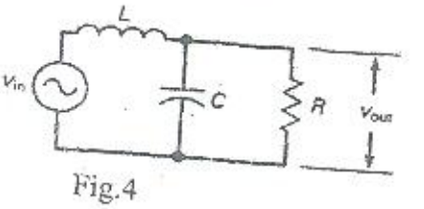


Fig.4

b) For the MFB circuit shown in Fig.5,

i) What is the function of the variable resistor R_3?

ii) If R_1= 18K Ω, C=10nF, and R_3 varies from 20Ω to 60Ω, Find the bandwidth and the miaimum and maximum center frequencies. (8 Marks)

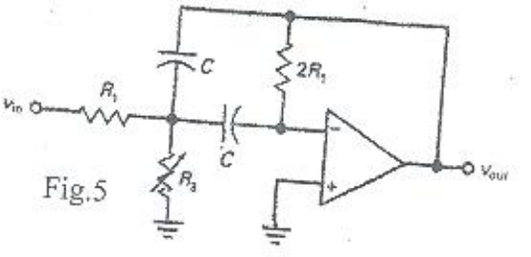


Fig.5

Question.5 (20 Marks)

a) Contrast the attenuation provided by a 4th order Chebychev filter at $\omega_s = 2\omega_p$ to that provided by a Butterworth filter with same order. For both A_{max}=1dB. Sketch |T| for both filters at the same axes. Comment on your results. (8 Marks)

b) Design a 5th order Butterworth low pass filter with f_{3dB}=5 KHz and total gain of 40 dB using a cascade of three stages. The first stage is a non inverting 1st order stage, the second is a 2nd order VCVS *unity gain*, and the third is a 2nd order VCVS *equal component*. Use as many 10KΩ as possible. The quality factor for each stage is indicated in the following table. Sketch the complete circuit indicating all the component values. (12 Marks)

Order	Stage 1	Stage 2	Stage 3
5	0.707	0.618	1.618

Best Wishes of Success
Prof. Said El-Halafawy

Tanta University

Department: Electronics & Comm. Engineering
Total Marks: 40 Marks

Faculty of Engineering

Course Title: Technical Reports	Course Code: EEC21H3	Year: 2nd
Date: January 2010 (First term)	Allowed time: 2 hrs	No. of Pages: (1)

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

Question number (1) **(10 Marks)**

a) Explain the steps in the engineering design process alongside the steps in the technical writing process. (5 Marks)

b) Write the basic outline for an experimental report and explain each item (5 Marks)

Question number (2) **(15 Marks)**

a) (i) Explain the factors that help you judge the value of information you find on the web site
(ii) What type of information that might be included in an appendix of a technical report
(6 Marks)

b) Create a checklist for the following types of documents:
(i) Internal and External Proposals
(ii) Progress reports
(iii) Resume (9 Marks)

Question number (3) **(15 Marks)**

a) Describe common types of graphs and charts you may use in technical reports showing when and where each should be used. (7 Marks)

c) Explain with drawing an organizational charts that can be used in a project management Structure . (8 Marks)

Good Luck

Course Examination Committee

Prof. Mustafa M.Abd Elnaby
Dr. Heba Elkhoby
Prof. Mohamed Nasr
Dr.

Course Coordinator: Prof. Mustafa Mahmoud Abd Elnaby

Tanta University

Department: Electronics & Comm. Engineering
Total Marks: 90 Marks

Faculty of Engineering

Course Title: Electronic Measurements (1)	Course Code: EEC2105	Year: 2nd
Date: January 2010 (First term)	Allowed time: 3 hrs	No. of Pages: (2)

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

Question number (1) (15 Marks)

(a) A voltmeter reading 70 V on its 100 V range and an ammeter reading 80 mA on its 150 mA range are used to determine the power dissipated in a resistor .Both these instruments are accurate within ± 1.5 % at full scale deflection. Determine the limiting error of the power.

(b) (i) A d.c. circuit can be represented by an internal voltage source of 50V with an output resistance of 100 kΩ. Determine the minimum resistance of the voltage measuring device in order to achieve 99 % accuracy for the voltage measurement across its terminal.
(ii) A d.c. circuit can be represented by a voltage source of 10V in series with an output resistance of 1 kΩ . If an ammeter of 50 Ω resistance is connected to the source terminals for measurement of current. Determine the accuracy of measurement.

Question number (2) (25 Marks)

(a) Describe the principle of operation of a pressure transducer employing each of the following principle: (i) Resistive transducer (ii) Inductive transducer (iii) Capacitive transducer

(b) A parallel plate capacitive transducer uses plates of area 500 mm^2 which are separated by a distance 0.2 mm. (i) Calculate the value of capacitance when the dielectric is air having a permittivity of 8.85×10^{-12} F/m.
(ii) Calculate the change in capacitance if a linear displacement reduces the distance between the plates to 0.18 mm . Also calculate the ratio per unit change of capacitance to per unit change of displacement.
(iii) If a mica plate 0.01 mm thick is inserted in the air gap, calculate the value of original capacitance and change in capacitance for the same displacement. The dielectric constant of mica is 8.

Question number (3) (15 Marks)

(a) An amplifier of power gain 20dB has an input consisting of 100 μW signal power and 1 μW noise power .If the amplifier contributes an additional 100 μW of noise, determine:
(i) the output signal to noise ratio
(ii) the nose factor (iii) the noise figure

(b) Explain how 50% duty cycle can be obtained using 555 timer.

Question number (4) (15 Marks)

(a) Explain with help of the block diagram, the operating principle of a Dual slope integrating type DVM

(b) If the integrator contains a 100 kΩ and 1μF capacitor, and the voltage applied to the integrator input is 1V. (i) What voltage will be present at the output of the integrator after 1s.

P.T.O.

(ii) If a reference voltage is applied to the integrator at time t_1 is 5V in amplitude ,what is the time interval of t_2 .

Question number (5) **(20 Marks)**

a) (i) Explain with help of a circuit diagram, the operating principle of a Linear sweep using a constant current source.

(ii) A CRO having a bandwidth of 25 MHz is used to observe the signals, if the rise time of displayed signal = 20 nS . Find the rise time of the signal (10 Marks)

b) Explain with help of a block diagram, the operating principle of a Digital storage oscilloscope. (10 Marks)

Good Luck

Course Examination Committee

Prof. Mustafa M.Abd Elnaby
Dr. Heba Elkhoby
Prof. Mohamed Nasr
Dr. Mohamed Abd Elrahman

Course Coordinator: Prof. Mustafa Mahmoud Abd Elnaby

Tanta University

Physics & Engineering Mathematics Department
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Engineering Mathematics (3A) | Course Code: PME2110 | Year: 2nd
Date: 27 /1 / 2010 (First term) | Allowed time: 3 hrs | No. of Pages: (2)

Remarks: (Answer the following questions. Assume any missing data…)

Problem number (1) **(14 Marks)**

(a) Construct a divided - difference table for the following data

x	0.2	0.4	0.6	0.8	0.1
f(x)	2.0	2.3	2.8	3.5	4.5

Then obtain Newton's interpolating polynomials to estimate f (0.25) and f (0.9).

(b) Given the following data

x	3.0	3.5	4.0	4.5
f(x)	1.5	2.8	4.0	6.1

Approximate f (3.2) and f (4.4) using natural cubic spline approximation

Problem number (2) **(14 Marks)**

(a) " Richardson extrapolation is an additional technique for approximating derivatives of a function f that reduces the truncation error."
Derive an approximation which reduces the error to an order of h^4 and give a formula to the truncation error.
(b) Given $f(x) = \sin x + x$, approximate $f'(\pi/4)$ using Richardson's formula with $h = 0.1$. Compare the result with the true value.

Problem number (3) **(14 Marks)**

(a) Derive Simpson's rule for integration together with the error term. Then write Simpson's composite rule and an expression for the error.
(b) Use Simpson's composite rule with 2n = 6 to approximate

$$\int_0^{1.2} x e^{x^2}\, dx$$

Problem number (4) **(16 Marks)**

(a) Use the least square method of curve fitting for the following data to get a relation between the variables x and y in the form
$y = a e^{bx}$

x	2.0	4.0	6.0	7.0
y	160	460	2560	5120

(b) Using the linear shooting method (and Runge-Kutta method of order 2), solve the B V P
$y'' + (1-x)y' + xy = x$, $y(0) = 1$, $y(1) = 2$
With $h = 1/3$.

P.T.O.

Problem number (5) **(14 Marks)**

(a) Derive an approximate solution to the IVP

$$\frac{dy}{dx} = f(x, y) \quad , \quad y(x_0) = y_0$$

Using four terms in Taylor series " Taylor's method ".

(b) The velocity (m/s) of a body is given by the function

$$v(t) = 100 \ln(1+t) - t \quad , \quad t \geq 0 \quad , \quad x(0) = 0$$

Using Taylor's method with step size of 5 seconds, estimate the distance in meters travelled by the body from $t = 5$ to $t = 15$ seconds.

Problem number (6) **(15 Marks)**

(a) Approximate the solution of the following hyperbolic partial differential equations using the three level difference method

$$u_{xx} = u_{tt} \quad , \quad 0 < x < 1 \quad , \quad 0 < t < 1$$

Subject to

$$u(0,t) = u(1,t) = 0 \quad , \quad 0 \leq t \leq 1$$

$$u_t(x,0) = \sin(\pi x) \, , \quad u(x,0) = \sin(2\pi x) \quad , \quad 0 \leq x \leq 1$$

using $h = 0.25$, $k = 0.25$.

(b) Find an approximate solution to the steady state heat flow equation

$$u_{xx} + u_{yy} = 0 \quad , \quad 0 < x < \pi \quad , \quad 0 < y < \pi$$

Subject to the boundary conditions

$$u(x,0) = u(0,y) = u(x,\pi) = 0 \quad , \quad 0 \leq t \leq 1$$

$$u(\pi, y) = \sin(y) \quad , \quad 0 \leq y \leq \pi$$

using $h = k = 0.5$.

Good luck

Dr. Manal Mohamed Hekal

Tanta University

Elec. Power and Machines Engineering Department

Faculty of Engineering

Course Title	: Electromagnetic Fields		Course Code : EPM2104
Date	: Jan 25th 2010 (First term)		Allowed time : 3 hrs
Total Marks : 85		No. of Pages: (2)	Year : 2nd Power

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

Question(1) *(a=6 Marks, b=15 Marks)*

a) Derive an expression for the electric flux density D at a point (0,0,z) due to an infinite sheet of charge on the plane $z = 0$, having a uniform charge density ρ_s C/m^2.

b) Three concentric cylindrical surfaces have radii $\rho_1 = 2.5$ m, $\rho_2 = 3.5$ m, $\rho_3 = 5$ m. The three cylindrical surfaces carry uniform surface charge densities of : $\rho_{s1} = 10$ nC/m^2 , $\rho_{s2} = -30$ nC/m^2 , $\rho_{s3} = \rho_s$ respectively.

i) Find D at $\rho = 2, 3, 4$ m

ii) Find ρ_s such that $D = 0$ at $\rho = 6$ m

Question(2) *(6=5 Marks, b=15 Marks)*

a) Using Ampere's circuital law derive a mathematical expressions for the magnetic field intensity H from $\rho = 0$ to $\rho = \infty$ of an infinitely long coaxial transmission line carrying a uniformly distributed total conductor current I in the inner solid conductor and – I in the outer hollow conductor, given that the inner solid conductor radius is h and the hollow outside conductor inner radius is b and its outer radius is c. Sketch H versus ρ from 0 to ∞.

b) Two parallel plates of a capacitor spaced by three different dielectric materials with relative permittivities 5, 4, 2 and thickness 2, 3, 1 mm respectively. If each plate has an area of 4 cm^2 and the total applied voltage is 500 V, calculate:

i) The total capacitance.

ii) The electric field intensity in each dielectric material.

iii) The voltage across each dielectric material.

iv) The energy stored in each dielectric material.

P.T.O.

Question(3)

(a=6 Marks, b=15 Marks)

a) Defining each term used, write the Maxwell's equations in its integral form for static Fields.

b) Using a cylindrical coordinates ($0 \ll \rho \ll a$, $0 \ll \Phi \ll \pi$, $0 \ll z \ll z$), find the electric field intensity and the stored energy in this electric field over this cylinder if:

i) $V = \frac{\rho V_o}{2a}$

ii) $V = V_o \cos^2 \Phi \left(\frac{\rho}{a}\right)$

Question(4)

(a=6 Marks, b=16 Marks)

a) Aided with clear sketches, derive expressions that determine the perfect dielectric material properties at the surface between two dielectric materials when they are placed in an external electric field using the boundary conditions.

b) Calculate the force produced on a square loop ABCD in z = 0 plane carrying a current of 5 mA flowing from D to C to B to A to D (clockwise direction) due to a current carrying conductor of 10 A and placed on the plane z = 0, X = 0, and its direction is in the +ve y direction, where coordinates of the square loop are: A(2,0,0), B(4,0,0), C(4,2,0), and D(2,2,0).

Good Luck

Prof. M.A.El-Khazendar

Course Examination Committee

Prof. M.A. El-Khazendar

Dr. M.K. Elnemr

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Course Coordinator: Prof. M.A. El-Khazendar

Tanta University

Department: Electronics and Electrical Communication Eng.
Total Marks: 100 Marks

Faculty of Engineering

Course Title: Communication Theory
Date: 23/1/2010 (First term)
Course Code: EEC 2104
Allowed time: 3 hrs
Year: 2nd
No. of Pages: (2)

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

Problem number 1

(25 Marks)

(A) Write short notes about the following : (10 Marks)
Energy signal, Discrete spectrum, AM envelope distortion, Quadrature Carrier Multiplexing and Noise Figure.

(B) Find the compact trigonometric Fourier series for the periodic square wave shown in Figure 1, and sketch its amplitude and phase spectra. (10 Marks)

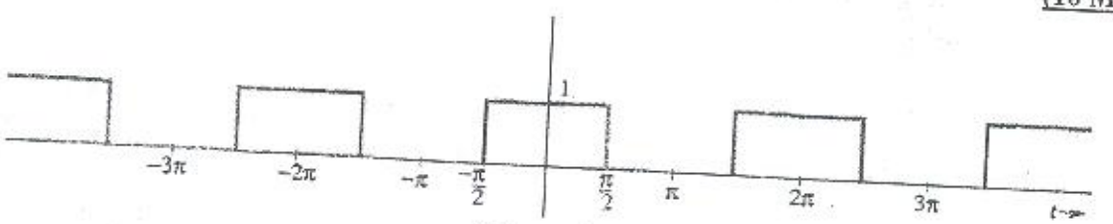

Figure 1

(C) Find the inverse Fourier transform of $G(w)$ for the spectrum shown in Figure 2. (5 Marks)

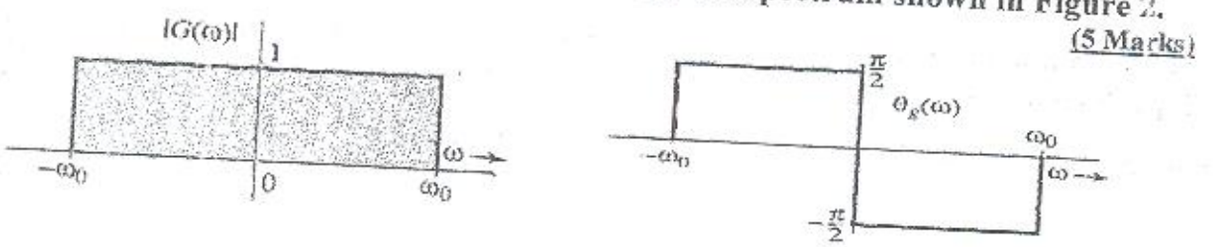

Figure 2

Problem number 2

(25 Marks)

(A) Define and represent the AM mathematically in time domain and frequency domain. Draw the AM envelope for all different cases, and draw the AM frequency spectrum. (10 Marks)

(B) Explain briefly how to generate the amplitude modulated wave using switching modulator. (7 Marks)

(C) You are given the signal $m(t)$ as (8 Marks)

$$m(t)=10\,rect\,[(t-10^{-4})/2\times10^{-5}]+10\,rect\,[(t+10^{-4})/2\times10^{-5}]$$

i- Sketch the signal in t-domain.

ii- Obtain and sketch the spectrum of $M(f)$.

iii- Is it energy signal or power signal ? why ?

iv- Find the ESD of this signal.

P.T.O.

Problem number 3 (25 Marks)

A) Define and represent mathematically the frequency modulation. (7 Marks)

B) Deduce the instantaneous frequency expression using sinusoidal modulating wave. (6 Marks)

C) A receiver picked up the signal (12 Marks)

$$v(t) = 10\cos\left[2\pi(4\times10^{6})t + 0.8\sin(2\pi\times600t)\right]$$

and the modulating signal amplitude is $4\ Volt$.

(i) Define the modulation type, calculate the bandwidth of the modulated signal, and carrier power.

(ii) Draw the frequency spectrum of the modulated signal and calculate the frequency deviation.

(iii) Show the effect of changing the modulating signal amplitude to $7\ Volt$, and the effect of changing the modulating signal frequency to $350\ Hz$.

Problem number 4 (25 Marks)

A) Derive the mathematical expression of Figure of Merit using SSB Receiver model. (8 Marks)

B) Derive the mathematical expression of Figure of Merit for an AM-Receiver using envelope detector, and compare it with SSB- Figure of Merit. (9 Marks)

C) Derive the mathematical expression of Figure of Merit using FM received model. (8 Marks)

Best Wishes of Success

Course Examination Committee

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Course Coordinator: Prof. Mostafa Abdel Nabi