انتصالات

Tanta University

Department: Engineering Physics and Mathematics
Total Marks: 70 Marks

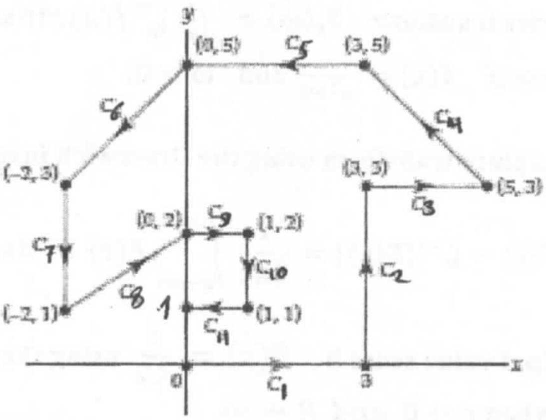
Faculty of Engineering

Course Title: Eng. Mathematics(3B)	Course Code: PME2210	Year: 2nd(Communication and Elec. Eng.)
Date: May26, 2018(2nd term)	Allowed time: 3 Hrs.	No. of Pages: (2)

SOLVE THE FOLLOWING QUESTIONS

QUESTION NUMBER 1 [35 MARKS]

1. **Represent graphically the set of values of z for which satisfying $|z| > 1$ and $Arg\{z\} \geq \pi$.**
2. **Let $f(z) = \bar{z}e^{|z|^2}$, determine the points at which the first derivative exists.**
3. **Represent all singular points of $f(z)\,\frac{1-z^2-\cos z^2}{\sin z^2}$ in z-plane and classify them.**
4. **Locate in which region of z-plane the zeros of the polynomial function $z^9 - 8z^2 + 5 = 0$.**
5. **Evaluate $\oint_C (2z+1)dz$ on the contour C, comprised of line segments C_1, C_2, ..., C_{11} shown in the following figure,**



6. **Use Nyquist's diagram to test the stability of an engineering system having the characteristic equation $f(z) = z^3 + 6z^2 + 9z + 6 = 0$.**
7. **Evaluate $\int_0^{2\pi} \frac{d\theta}{25-24\cos\theta}$.**

QUESTION NUMBER 2 [20 MARKS]

1. **Calculate $\Gamma\left(-\frac{3}{2}\right)$ *and* $\beta(\frac{3}{2},\frac{7}{2})$ and evaluate the integral $\int_0^1 \sqrt{Ln(\frac{1}{x})}\,dx$.**
2. **Using the Gamma function identity $\Gamma(z)\Gamma(1-z) = \frac{\pi}{\sin \pi z}$ to prove that $|\Gamma(in)| = \sqrt{\frac{\pi}{n\sinh(\pi n)}}$ and sketch $\Gamma(n)$ *and* $|\Gamma(in)|$ versus n, where $n \in \mathbb{R}$ and $i^2 = -1$.**
3. **Obtain the power series solution for the following second order linear O.D.Es**

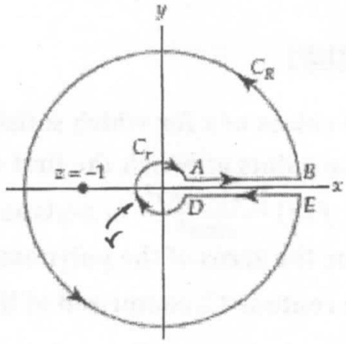
   a- $(1+x^2)y'' - 4xy' + 6y = 0$ near the point x=0, with $y(0) = 1$, $y'(0) = 1$.

   b- $4xy'' + 2y' + y = 0$ near the point x=0.

P.T.O

QUESTION NUMBER 3 [15 MARKS]

1. Evaluate $\int_0^\infty \frac{dx}{\sqrt{x}(x+1)}$ in the Cauchy principal value sense using the following contour when $r \to 0$ *and* $R \to \infty$.

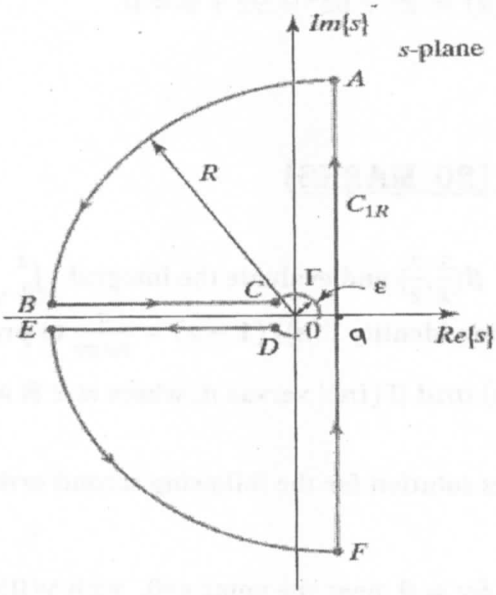


2. Find the Sine Fourier transform $F_s(\omega) = \sqrt{\frac{2}{\pi}} \int_0^\infty f(x)\, \sin\omega x \, dx$ in the Cauchy principal value sense if $f(x) = \frac{x}{x^2+9}$ and $\omega > 0$.

3. Find the inverse Laplace transform using the Bromwich inversion theorem

$$f(t) = L^{-1}\{F(s)\} = \frac{1}{2\pi i} \int_{a-i\infty}^{a+i\infty} F(s)\, e^{st} ds$$

in the Cauchy principal value sense if $F(s) = \frac{1}{\sqrt[5]{s}}$ using the following modified Bromwich contour when $\epsilon \to 0$ *and* $R \to \infty$.



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ALL THE BEST

DR.ENG. : MOHAMED ELBORHAMY AND THE COMMITTEE

تانية اتصالات ٢٠/٥/٢٠١٨

Tanta University | *Department: Electronics & Electrical Communications* | *Faculty of Engineering*

Total Marks: (90) Marks

Course Title : Com. Engineering	*Course Code: EEC2207*	*2nd Year: 2017/2018*
Date: 30/5/2018	*Allowed time: (3) hrs.*	*No. of Pages: (1)*

Answer the following Questions

Q 1 : ***(18M)***

a) *State the advantages of digital over the analogue transmissions, hence, explain the most significant impairments in each case.*

b) *If the noise power at the output of the receiver, for a white noise input, is* N_o ***W****.*
Prove that: the output SNR in AM- DSB-SC, is the same as the SNR for a baseband systems.

Q2: ***(18 M)***

a) *What is the meaning of Quantization process ,Time of conversion ,and Resolution?*

b) *A PCM system uses a uniform quantizer followed by a* **8** *bit encoder. The system bit rate is* **48** *M bits/sec. Calculate :*
- *Sampling frequency*
- *Maximum bandwidth of the message signal for which this system operates satisfactory.*

Q3 ***(18 M)***

a) *What is the meant by FDM and, hence, draw its block diagram?*

b) *Using sketches, what is the meant by :*
* *Sample and Hold circuit .* * *Analogue &Digital Converts.* * *PAM?*

Q4 ***(18 M)***

a) *Using sketches ,what is the meant by the Line coding schemes.*

b) *Sketch the simplified block diagrams of the DM . Using sketches, define on the o/p waveform : i) Slope over load noise and granular noise,*
ii) State haw to reduce these noise

Q5 ***(18 M)***

a) *If the bandwidth of the audio signal =* **3.4** kHz . *Calculate:*
* *The total bandwidth required for AM system*
* *The total bandwidth required for FM system, if* $\Delta f = 17$ *kHz*

b) *Using the VCO block ,show how to generate the following systems:*
i) Frequency Modulation (FM). *ii) Phase Modulation (PM).*

--- ***Good Luck*** ---

Prof. Mohamed El-Said Nasr

ربع شرف

Tanta University	**Department of Electronics and Electrical Communication Engineering**	**Faculty of Engineering**

Course Title: **Electronic Measurements (2)** Course Code: EEC 2209, Students: **2nd year.**
Date: **Sat.,02-June-2018,** Time Allowed: **3 hours,** No. of Pages: **2**
Total Marks: **75**
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: (25 Marks)

a) Calculate the h parameters for the high frequency model for a BJT that is given in the circuit shown in Figure 1 and draw the resulted two-port network.

b) Deduce the purpose of the circuit shown in Figure 2 and the purpose of the transistor Q_2. If $V_{IN} = 14\,V$ and $R_4 = 2.2\,\Omega$, find V_{OUT}. If V_{OUT} is connected to a resistive load of $5\,\Omega$, what will the current in it?

c) Draw the circuit diagrams for the step-up, step-down and inverter switching regulators and compare their operation.

Question 2: (25 Marks)

a) Draw the circuit diagram for an operational transconductance amplifier (OTA) that can be used for AM generation and show how it works.

b) Find the gain of the isolation amplifier shown in Figure 3 and give the internal block diagram of it and the function of each block.

c) Sketch the circuit of a 555 timer connected as an astable multivibrator. For operation at 250 kHz, Determine the value of capacitor, C, needed using $R_A = 1.5R_B = 15K\Omega$.

d) Draw the circuit of a one-shot using a 555 timer to provide one time period of $20\mu s$. If $R_A = 15\,K\Omega$, what value of C is needed?

Question 3: (15 Marks)

a) Explain the structure and operation of the phase locked loop circuit.

b) Draw the basic block diagram for a frequency synthesizer and deduce the function of each block

c) Using the 565 IC frequency demodulator shown in Figure 4,

   i. Calculate the VCO's free-running frequency with $C_2 = 330nF, R_1 = 5.1\,K\Omega$ and $C_1 = 1\,nF$.

   ii. What is the lock range and capture range for the configuration given in (i)?

Question 4: (10 Marks)

a) Draw a circuit for the double tuned amplifier. It is desired to obtain a bandwidth of 250 kHz at an operating frequency of 5.5 MHz.

   i. What value of co-efficient of coupling should be used?

ii. Draw the ac model of the circuit

iii. Draw the response of the circuit for tight, loose and optimum coupling.

b) Draw a circuit for a single tuned amplifier and state the expressions for the resonance frequency f_r, the quality factor, Q and the dynamic impedance Z_r

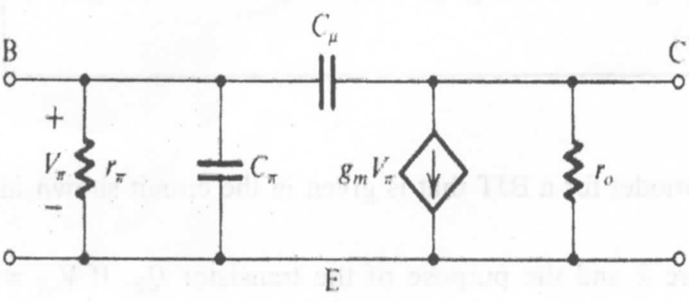


Figure 1

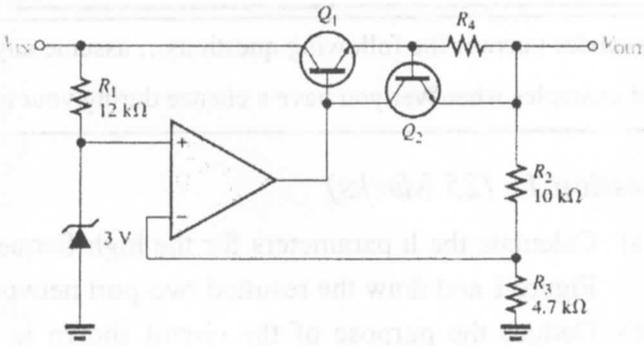


Figure 2

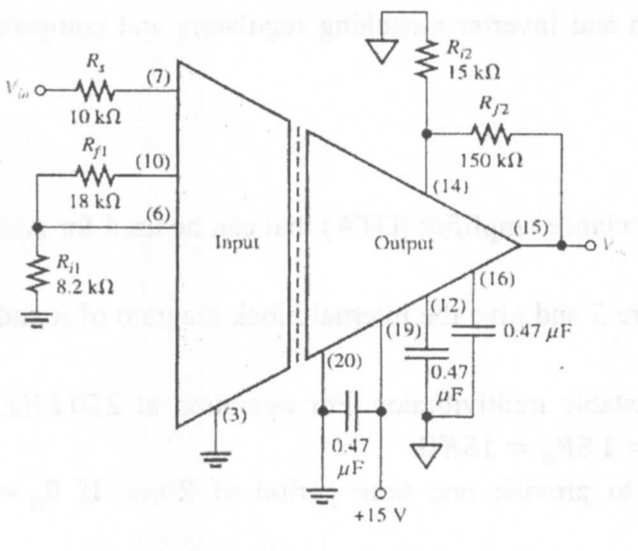


Figure 3

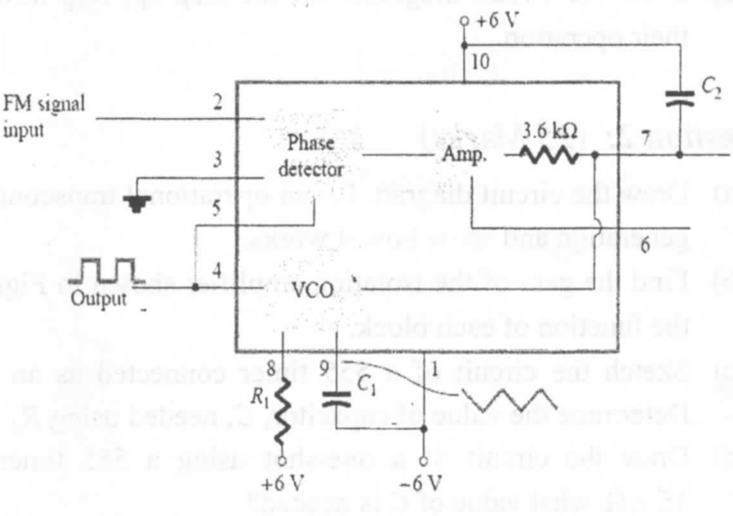


Figure 4

The end of questions

Use only black or blue pens or pencils in your answer

Do not make any mark in your booklet

Answer only the required questions (Extra answers will not be considered)

Good luck

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

ح اتصالات ٦ ٦ ٢٠١٨

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

Total Marks: 90 Marks

Course Title: Electronic Circuits (2)	**Course Code: EEC2206**	**Year: 2^{nd} year**
Date: 6/6/2018	**Allowed time: 3h**	**No of Pages (3)**

Remarks: (answer the following questions, assume any missing data, answers should be supported by sketches, Neat answers and boxed results are appreciated)

Question (1)

(a) Answer true or false to each of the following questions. For false sentence, write the correct one.

1) Filters with the Butterworth response are normally used when all frequencies in the passband must have the same gain (True / False).
2) The phase response of Butterworth is linear, however, and the phase shift of signals passing through the filter varies linearly with frequency (True / False).
3) Filters can be implemented with the Chebyshev response with fewer poles and less complex circuitry for a given roll-off rate (True / False).
4) Filters with the Chebyshev characteristic have overshoot in the passband, and exhibit a slower roll-off per pole than filters with the Butterworth characteristic (True / False).
5) Butterworth filters have a roll-off of 40 dB/decade and a widely varying output in the passband (True / False).

(b) For Each Question, Choose the Correct Answer from the Multiple-Choice List.

b1. Low Q filters are ……… circuits, and high Q filters are ……… circuits.
1) bandpass, bandstop
2) wide bandpass, narrow bandpass
3) low pass, high pass
4) low order, high order

b2. A high pass filter has a cutoff frequency of 1.23 kHz. The bandwidth of this filter is:
1) 1.23 kHz
2) 2.46 kHz
3) 644 Hz
4) None of these

b3. A vey stable oscillator is needed to operate on a single frequency, a good choice might be:
1) Hartley
2) Colpitts
3) Crystal
4) Clapp

b4. A circuit that can change the frequency of oscillation with an application of a dc voltage is sometimes called

1) Voltage controlled oscillator
2) Crystal oscillator
3) Hartlry oscillator
4) Astable oscillator

b5. The voltage that starts a frequency oscillator is caused by

1) ripple from the power supply
2) thermal noise in resistors
3) the input signal from a generator
4) positive feedback

b6. A Wien-bridge oscillator uses:

1) positive feedback
2) negative feedback
3) both types of feedback
4) an LC tank circuit

Question (2)

(a) For the following transfer function:

$$T(s)=\frac{a_1 s+a_0}{s+w_0}$$

i. Sketch clearly the Bode plot of $|T|$.

ii. Realize this function using passive and active circuits. For each circuit, determine a_0/a_1, w_0, dc and high frequency gain.

(b) A third-order LPF has transmission zeros at $w=\infty$, $w=2$ rad/sec its natural modes are at $s=-1$ and $s=-0.5\pm j0.8$. The dc gain is unity. Find $T(s)$.

(c) Consider a fifth-order filter whose poles are all at a radial distance from the origin of 10^3 rad/s. One pair of complex conjugate poles is at 18° angles from the jw axis, and the other pair is at 54° angles. Give the transfer function in each of the following cases:

i. The transmission zeros are all at s = ∞ and the dc gain is unity.
ii. The transmission zeros are all at s = 0 and the high frequency gain is unity.
iii. What type of filter results in each case?

Question (3)

(a) For the following transfer function:

$$H(s)=\frac{as^2+bs+c}{s^2+ds+e}$$

i. Determine a, b, and c so that the filter corresponds to a lowpass, highpass, and bandpass filter, respectively.
ii. What is the relation between d and e that ensures that the poles form a complex-conjugated pole pair?

(b) Synthesis the first Cauer form for the first network, and the second Cauer form for second network using RC elements; the network having the following functions:

(i) $Y(s)=\dfrac{2s+s^2}{3+4s+s^2}$ (ii) $Z(s)=\dfrac{s^2+7s+4}{3s^2+2s}$

Question (4)

(a) Obtain an LC ladder of a singly-terminated network, when terminated in a 1-ohm resistance, will give the transfer impedance, (use as few elements as possible.).

$$Z_{21}(s)=\frac{Ks}{s^3+2s^2+2s+1}$$

Evaluate K.

(b) Synthesize the following transfer function, of a double terminated network, for a 1K load resistor.

$$H(s)=\frac{Ks^3}{s^4+s^3+4s^2+2s+3}$$

(c) For the following lossless function:

$$Z(s)=\frac{(s^2+4)\ (s^2+16)}{s\ (s^2+9)}$$

Find Foster expansion and Foster realization, showing clearly steps of removing poles.

Best Wishes of Success
Dr. Heba El-Khobby

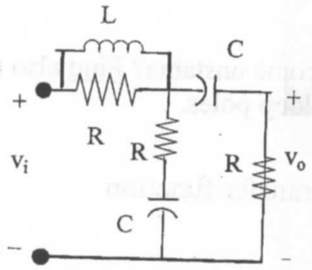
Tanta University
Department: Electronics and Electrical Communication Engineering
Total Marks: 70 Marks

Course Title: Automatic control Engineering Date: june 2018	Course Code: CCE2251 Allowed time: 3 hrs	Year: 2^{nd} No. of Pages: (2)

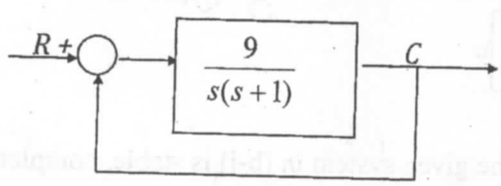
Answer the following questions

Problem number (1)

[a] Find the transfer function for the following circuit $V_o(s)/V_i(s)$ (8 Marks)



[b] For the following system: (10 Marks)



1) Find the type of the system and the order?
2) Determine the natural frequency and damping factor?
3) Determine the steady state error for step input?

Problem number (2)

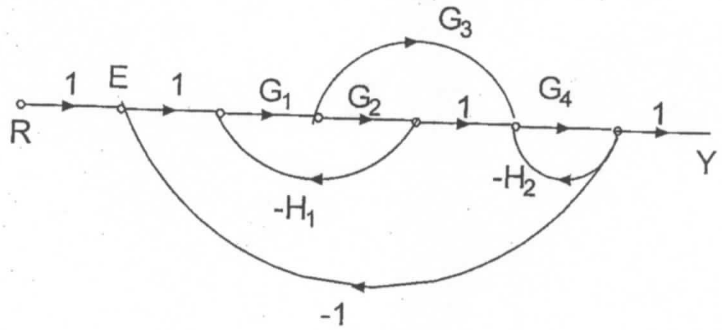
[a] The characteristic equations of linear control systems are given below. Apply Routh-Hurwitz criterion to determine the root distribution and the system stability. (9 Marks)

1) $S^7 + 3S^6 + 3S^5 + S^4 + S^3 + 3S^2 + 3S + 1 = 0$

2) $s^5 + 8s^4 + 2s^3 + 4s^2 + 2s + 4 = 0$

3) $S^6 + S^5 + 2S^4 + 2S^3 + 3S^2 + 2S + 4 = 0$

[b] Using signal flow graph, find the transfer function of the system **Y(s)/R(s)** (8 Marks) and **Y(s)/E(s)**. (3 Marks)



Problem number (3) (10 Marks)

For positive values of K, plot the root locus for a unity negative feedback control system having the following open-loop transfer function:

$$G(s) = \frac{K}{(s+1)(s+4)(s+7)}$$

For what values of gain K does the system become unstable? Find also the value of k at which the damping ratio is 0.5 and the closed loop poles.

Problem number (4)

[a] For the system that have the following transfer function

$$\frac{Y(s)}{U(s)} = \frac{(s+8)(s+5)}{s(s+2)(s^2+4s+6)}$$

Give the state space in pole-zero form (7 Marks) and in controllable form (3 Marks).

[b] (i) For the following system draw the state diagram. (3 Marks)

$$\dot{\underline{X}} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} \underline{X} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 2 & 3 \end{bmatrix} \underline{X}$$

(ii) Determine whether the given system in (b-i) is stable, completely state controllable, and observable or not. (5 Marks)

[c] Given a system described by the dynamic equations

$$\frac{\mathbf{dx(t)}}{\mathbf{dt}} = \mathbf{Ax(t) + bu(t)} \qquad \mathbf{y(t) = cx(t)}$$

where

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -1 & -2 \end{bmatrix} \qquad b = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \text{ and } \quad c = \begin{bmatrix} 1 & 1 & 0 \end{bmatrix}$$

(i) The characterstic equation. (2 Marks)

(ii) Find the transfer function $Y(s)/U(s)$. (2 Marks)

مع أطيب الأمنيات بالتوفيق

٣ اتصالات
١٣/٦/٢٠١٨
موجات كهرومغناطيسية

Tanta University

Department: Electronics and Communication Engineering

Total Marks: (85) Marks

Faculty of Engineering

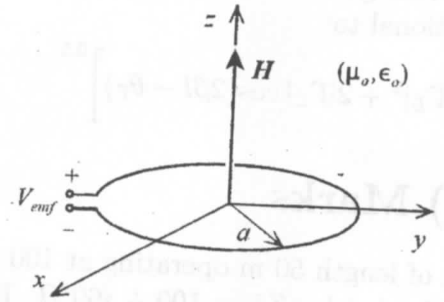
Course: Electromagnetic Waves (1)		
Date: 13/6/2018 (**Final Exam**)	**Course Code:** EEC 2208 **Time:** 3 hours	**Year:** 2nd Semester 2017-2018 **No of Pages:** (2) pages

Remarks: Answer all of the following Questions and assume any missing data.

Question # 1: (15) Marks

(a) (**7 Marks**) A parallel-plate capacitor with plate area of 3 cm^2 and plate separation of 2 mm has a voltage $10 \sin 10^3 t$ V applied to its plates. Calculate the displacement current assuming $\epsilon = 4\epsilon_o$.

(b) (**8 Marks**) A circular wire loop of radius $a = 0.4$m lies in the x-y plane with its axis along the z-axis. The vector magnetic field over the surface of the loop is $\boldsymbol{H} = H_o \cos(\omega t)\boldsymbol{a}_z$ where $Ho = 0.3$ mA/m and $f = 1$ MHz. Determine the emf induced in the loop.



Question # 2: (15) Marks

(a) (**4 Marks**) In free space, $E = 10\cos(wt - 30x)\mathbf{a}_z$ V/m. Calculate ω.

(b) (**7 Marks**) If an electromagnetic wave is propagating from free space to sea water having $\epsilon_r = 32$ and $\sigma = 10^{-2}$ ℧/m where $\mathbf{D_1} = 2\mathbf{a}_x + 6\mathbf{a}_y - 10\mathbf{a}_z$ C/m^2 and $\mathbf{H_2} = 3\mathbf{a}_x + 5\mathbf{a}_y + 9\mathbf{a}_z$ A/m evaluate $\mathbf{B}_1, \mathbf{E}_2$.

(c) (**4 Marks**) Write down the boundary conditions between two mediums assume the second medium is perfect conductor.

Question # 3: (20) Marks

(a) (**6 Marks**) A plane wave $\mathbf{E}(x,t) = 10^{-3}e^{j(2\pi 10^8 t - 6\pi x)}\mathbf{a}_y + E_{02}e^{j(2\pi 10^8 t - 6\pi x + \theta_o)}\mathbf{a}_z$ V/m is propagating in a lossless medium. Estimate the values of E_{02} and θ_o for:

i. Linearly polarized wave at 70^o with z axis.

ii. Anti-clockwise circularly polarized wave.

(b) **(10 Marks)** An EMWs incident from a dielectric medium ($y > 0$) having ϵ_{r1} to another medium ($y < 0$) with $\epsilon_{r2} = 64$ are given by: $\mathbf{E}_i(y, z, t) = 10^{-4} e^{j(2\pi \times 10^9 t + 6\pi y - 8\pi z)} \mathbf{a}_x$ V/m. Assume lossless dielectric mediums,

i. What is the type of incidence as well as the type of polarization.

ii. Evaluate α, β, v_{ph}, η for each plane, θ_i, θ_r, θ_t, R.

iii. Obtain an expression for $\mathbf{H}_i(y, z, t)$ and $\mathbf{E}_t(y, z, t)$.

(c) **(4 Marks)** Check occurrence of total transmission and total reflection in (b).

Question # 4: (15) Marks

(a) **(7 Marks)** A TL 15 km long is terminated in its characteristic impedance 600 Ω. The sending end voltage is $5\angle 0^0$ V at an angular frequency of 10^4 rad/s, and the resulting voltage at the receiving end is measured as $0.88\angle -80^0$ V. Calculate the primary constants of the line (R, L, G, C) per kilometer.

(b) **(8 Marks)** Prove that the voltage measured along a lossless TL at a distance L from the termination is proportional to:

$$\left[1 + |\Gamma_L|^2 + 2|\Gamma_L| \cos(2\beta l - \theta_\Gamma)\right]^{0.5}$$

Question # 5: (20) Marks

(a) **(10 Marks)** A lossless TL of length 50 m operating at 100 MHz having $L = 100$ μH/m and $C = 40$ nF/m and loaded by $ZL = 100 + j60\ \Omega$. Evaluate α, β, v_{ph}, Z_0, Γ_L, σ , Γ at 20 m from the load and Z_{in}

(b) **(10 Marks)** A lossless TL of length $l = 0.15\lambda$ and $Z_0 = 50\Omega$ is terminated with a load of $Z_L = 60 - j40\ \Omega$. Assume $\lambda = 3m$ and using Smith chart, Find:

i. Γ_L, VSWR at the load, the position of the first voltage maximum from the load, and the position of the first minimum from the load.

ii. Z_{in} and admittance Y_L.

Constants:
Permittivity of free space, $\epsilon_0 = 8.854 \times 10^{-12}$ F/m
Permeability of free space, $\mu_0 = 4\pi \times 10^{-7}$ H/m

Good Luck

Dr. Hussein E. Seleem