ح اتصالات

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

Total Marks: (90) Marks

Course Title : Com. Engineering	Course Code: EEC2207	2^{nd} Year: 2018/2019
Date: 1/6/2019	Allowed time: (3) hrs.	No. of Pages: (1)

Answer the following Questions

Q 1 : **(18M)**

a) A major problem in designing a communications facility is transmission impairment, explain its various types and state their effects on:

- **i-** Analog signals
- **ii-** Digital signals

b) If the noise power at the output of the receiver, for a white noise input, is N_o W. Compare between the effect of noise on Conventional AM and AM- DSB-SC .

Q2 **(18 M)**

a) Using sketches, what is the meant by :

- **i-** Sample and Hold circuit
- **ii-** Generation of PWM from PAM?

b) A super heterodyne receiver must cover the range from 220 to 224 MHz. The first IF is 10.7 MHz; the second is 1.5 MHz. Find:

- **i-** the local oscillator tuning range,
- **ii-** the frequency of the second local oscillator, and
- **iii-** the first IF image frequency range.

(Assume a local oscillator frequency higher than the input by the IF.)

Q 3 **(18 M)**

a) Draw the main block diagram of an FM system containing the following blocks:

- **i-**Pre-emphasis
- **ii-**De-emphasis filter ,

and hence sketch the characteristics of these blocks and their benefits.

b) If the bandwidth of the audio signal =**15** kHz . Calculate:

- **i-**The total bandwidth required for AM system
- **ii-**The total bandwidth required for FM system, if Δf=75 kHz

---

Q4 **(18 M)**

a)Draw the block diagram of the superhetrodyne FM receiver and explain the function of the following: **i-**The two mixer stages. **ii-**The limiter.

b) Draw the block diagram of the FM slope detector and briefly explain its operation.

c) Draw the block diagram of the quadrature FM demodulator and briefly explain its operation.

Q5 **(18 M)**

a)Define with drawing the following terms:

- **i-**The monophonic FM.
- **ii-**SCA subcarrier.

b)Draw the block diagram of the stereophonic FM transmitter and briefly explain its operation indicating the spectrum of the composite stereophonic FM signal.

c)Draw the block diagram of the stereophonic FM receiver and briefly explain its operation

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

Prof. Mohamed Nasr & Dr Amr Hussien

م اتصالات

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

Course Title: **Electronic Measurements (2)** Course Code: EEC 2209, Students: 2^{nd} **year.**

Date: **Mon.,03-June-2019,** 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: (20 points)

a) Using the series regulator 7812 IC design a current source that can supply 1.5 A.

b) Draw a circuit for an adjustable-output series regulator and show how the output voltage is related to circuit elements.

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

d) Draw a circuit for shunt voltage regulator. If the Zener voltage is $5.1V$, choose resistor values to adjust the output to $12V$. If it is required to limit the load current to $500mA$, what should you add to the regulator circuit to accomplish this requirement?

Question 2: (25 points)

a) Draw the internal block diagram of an isolation amplifier and describe the purpose of each block.

b) Draw a circuit for an adjustable gain voltage amplifier using an OTA and drive the equation for the gain.

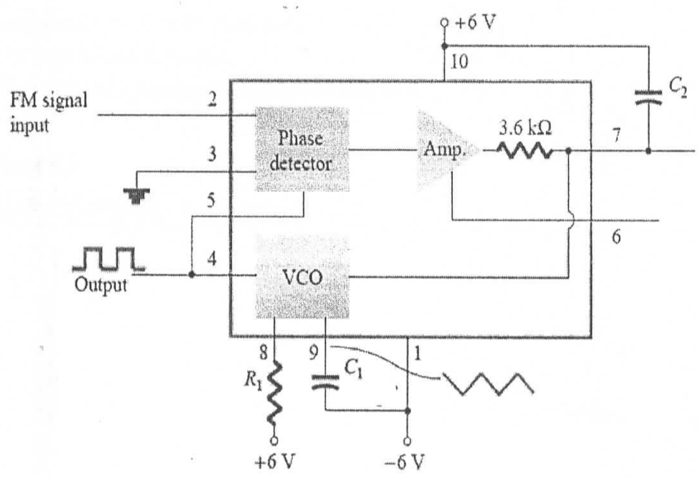
c) Explain the structure and operation of the phase locked loop circuit. Define lock and capture range.

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

e) For the 565 IC phase locked loop shown in the figure,

   i. Calculate the VCO free-running frequency with $C_2 = 380nF, R_1 = 4.7\ K\Omega$ and $C_1 = 1.2\ nF$.

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



Question 3: (10 points)

a) Draw a circuit for the double tuned amplifier it is desired to obtain a bandwidth of 450 kHz at an operating frequency of 10 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

Question 4: (20 points)

a) A DSP system is described by the following difference equation:

$$y(n) + 0.2y(n-1) - 0.7y(n-2) = x(n-1) - 0.5x(n)$$

   i. Find the z-transform of that system
   ii. Find the impulse response of the system
   iii. Find the step response for the system

b) Find the inverse Z-transform for

$$X(z) = \frac{z^2}{(z^2-1)(z-0.5)}$$

c) For a certain digital measurement instrument, design a second order digital high pass filter using IIR method. The cutoff frequency is 15 KHz, the sampling rate of the system is 100 KHz. Then implement your design using direct form I and direct form II.

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)

٢ اتصالات

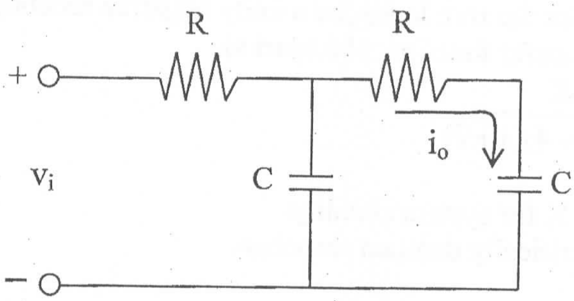
Tanta University

Department: Computers and Automatic Control
Total Marks: 70 Marks

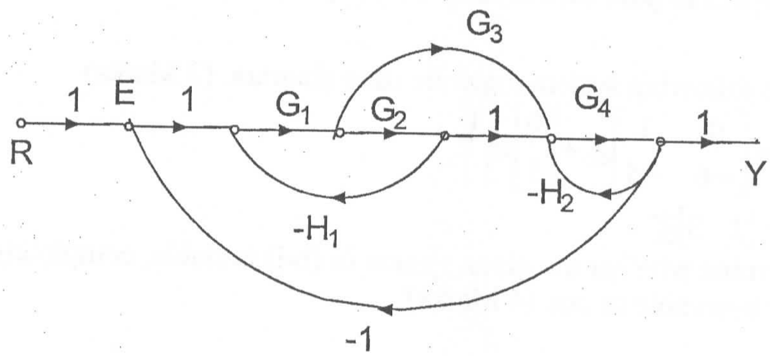
Faculty of Engineering

Course Title: Automatic control Engineering Date: June 2019	Course Code: CCE2251 Allowed time: 3 hrs	Year: 2nd

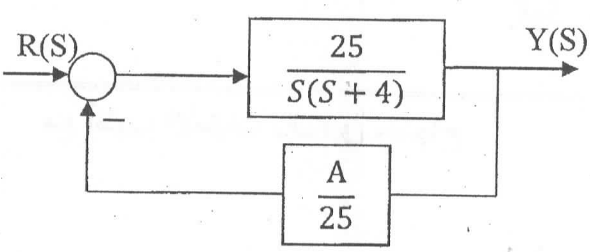
Q1) [a] Find the mathematical model (transfer function) of the following system. (8 Marks)



[b] Using signal flow graph, find the transfer function of the system $Y(s)/R(s)$ (8 Marks) and $Y(s)/E(s)$. (4 Marks)



[c] For the following feedback system: (10 Marks)



Find:

(i) The type of the system, the open loop and closed loop transfer function.
(ii) The value of A for critically damped system.
(iii) The error constants Kp, K_v and K_a
(iv) If A =25, find the natural frequency, peak time, and maximum overshoot for the step input.

Q2) [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] For positive values of K, plot the root locus for a unity negative feedback control system having the following open-loop transfer function: (10 Marks)

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

1) Sketch the root locus.
2) Determine the range of K for system stability.
3) Find the value of K at critically damped response.

Q3) [a] For the system that have the following transfer function

$$\frac{Y(s)}{U(s)} = \frac{(s+7)(s+5)}{s(s+3)(s^2+4s+9)}$$

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

[b] (i) For the following system draw the state diagram. (2 Marks)

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

$$y = [2 \;\; 3] \underline{X}$$

(ii) Determine whether the given system in (b-i) is stable, completely state controllable, and observable or not. (4 Marks)

[c] Find the matrix T to transform into diagonal form. (5 Marks)

$$\dot{\underline{X}} = \begin{bmatrix} -2 & 1 \\ 2 & -3 \end{bmatrix} \underline{X} + \begin{bmatrix} 2 \\ 1 \end{bmatrix} u$$

$$y = [4 \;\; 5] \underline{X}$$

مع أطيب الأمنيات بالتوفيق والنجاح

ع- إتصالات

٢٠١٩/٦/١٢

Tanta University

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

Faculty of Engineering

Course Title: Electronic Circuits (2) **Date: 12/ 6/ 2019**	**Course Code: EEC2206** **Allowed time: 3h**	**Year: 2^{nd} year** **No of Pages (2)**

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).

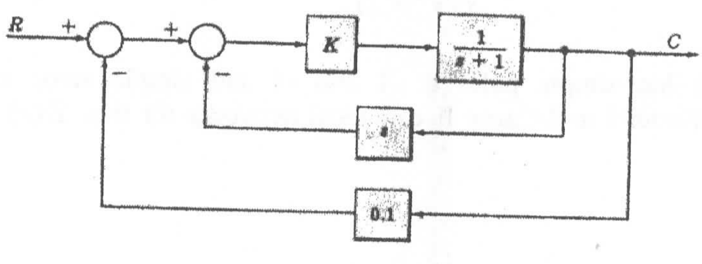
(b) A third-order LPF has transmission zeros at $w=\infty$, $w=2$ rad/sec its natural modes are at $s=-1$ and $s=-0.5\pm j0.8$. The dc gain is unity. Find $T(s)$.

(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 $s=\infty$ and the dc gain is unity.
ii. The transmission zeros are all at $s=0$ and the high frequency gain is unity.

Question (2)

(a) For the system represented by the following block diagram determine:



1. Open loop transfer function.
2. Feed Forward Transfer function.
3. Control ratio.
4. Feedback ratio.
5. Error ratio.
6. Closed loop transfer function.
7. Characteristic equation.
8. Closed loop poles and zeros if K=10.

(b) Determine the range of values of a system parameter K for which the system is stable.

$$s^3+3s^2+3s+1+K=0$$

Question (3)

(a) Define the rise time, peak time, maximum overshoot, and settling time.

(b) For second order system, Find the step response of underdamped system.

(c) An impulse response of first order system is given by $c(t)=3e^{-0.5t}$. Find time constant, dc gain, and step response.

(d) Describe the nature of the second order system response via the value of the damping ratio for the system with the transfer function

$$G(s)=\frac{12}{s^2+8s+12}$$

Question (4)

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

(b) Synthesis the following impedance using Foster I method.

$$\frac{(s^2+1)(s^2+3)}{s(s^2+2)}$$

(c) An impedance function has simple poles at -1 and -4 and simple zeros at -2 and -5, $Z(0)=10\,\Omega$. Find the Foster I and Cauer II canonical networks for this $Z(s)$ with element values.

Best Wishes of Success
Dr. Heba El-Khobby

الاتصالات

Tanta University

Department: Electronics and Communication Engineering

Faculty of Engineering

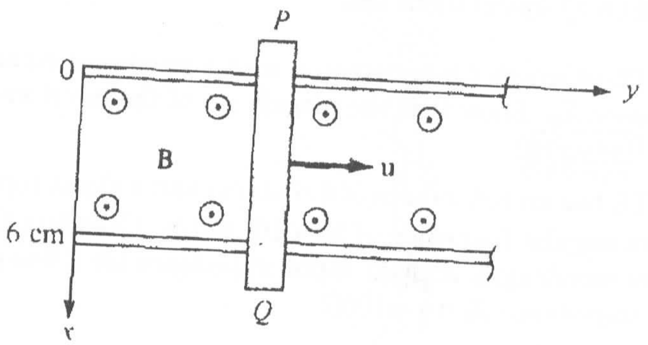
Total Marks: (85) Marks

Course: Electromagnetic Waves (1)	**Course Code:** EEC 2208	**Year:** 2nd Semester 2018-2019
Date: 19/6/2019 (**Final Exam**)	**Time:** 3 hours	**No of Pages:** (2) pages

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

Question # 1: (15) Marks

(a) **(10 Marks)** A conducting bar can slide freely over two conducting rails as shown in Fig. Calculate the induced voltage in the bar if it;
(i) Is stationed at $y = 8$ cm and $\mathbf{B} = 4\cos 10^6 t\mathbf{a}_z$ m Wb/m^2
(ii) Slides at a velocity $u = 20a_y$ m/s and $\mathbf{B} = 4\mathbf{a}_z$ m Wb/m^2



(b) **(5 Marks)** A 50 V voltage generator at 20MHz is connected to the plates of an air dielectric parallel-plate capacitor with plate area 2.8 cm^2 and separation distance 0.2 mm. Find the maximum value of displacement current density and displacement current.

Question # 2: (15) Marks

(a) **(5 Marks)** Starting with Maxwell's equations for time varying fields to drive the wave equation for the electric field propagating in the +ve z direction in free space. You may consider that the electric field strength has only x-component.
(b) **(10 Marks)** If an electromagnetic wave is propagating in a medium where **E** is given by $\mathbf{E}(y,t) = 10^{-4} e^{j(2\pi 10^9 t - 12\pi y)}\mathbf{a}_z$ V/m obtain:
(i) the type of the medium and the direction of propagation
(ii) $\alpha, \delta_{skin}, \beta, v_{ph}, v_g, \eta$, $\mathbf{H}(y,t)$ and $\mathbf{P}(y,t)$
(iii) the received power by an antenna with 2 m^2 effective area.

Question # 3: (15) Marks

(a) (4 Marks) If a perpendicular polarization plane wave is obliquely incident at θ_i from a dielectric medium with ϵ_{r1} to another dielectric medium having ϵ_{r2}, write down expressions for θ_r, θ_t, R, and T.

(b) (11 Marks) An EMWs incident from a dielectric medium having ϵ_{r1} to another medium with $\epsilon_{r2} = 64$ are given by: $\mathbf{H}_i(x, y, t) = 10^{-5} e^{j(6\pi\times10^8 t - 5\pi x + 12\pi y)} \mathbf{a}_z$ A/m. Assume lossless dielectric mediums,
(i) Evaluate α, β, v_{ph}, η for each plane, θ_i, θ_r, θ_t, R, T, $\mathbf{E}_i(x, y, t)$ and $\mathbf{H}_t(x, y, t)$.
(ii) Check occurrence of total transmission and total reflection.

Question # 4: (20) Marks

(a) (10 Marks) Drive an expression of the input impedance of a lossless TL, and express the circuit element equivalent to the following transmission lines;
(i) a $\frac{\lambda}{8}$ short circuit line, (ii) a $\frac{3\lambda}{8}$ open circuit line

(b) (5 Marks) A lossless TL of length l is terminated with a resistance equal to half to its characteristic impedance Z_0. Show that the magnitude of the input impedance to the line is: $|Z_{in}| = Z_0\sqrt{\frac{1+4\tan^2(\beta l)}{4+\tan^2(\beta l)}}$.
(c) (5 Marks) A lossless TL has an inductance of 0.6 μH/m and a shunt capacitance 240 pF/m and is used at an angular frequency of $2\pi \times 10^8$ rad/s. Calculate the phase change coefficients, the line wavelength, and the input impedance for a line of length $l = \lambda/4$ terminated by an impedance $Z_l = -j100\Omega$.

Question # 5: (20) Marks

(a) (5 Marks) Show how to achieve impedance matching using the quarter wave-length ($\lambda/4$) transformer.

(b) (15 Marks) Use Smith chart to plot the point corresponding to a load impudence $Z_L = 25 - j50\Omega$ terminating a lossless TL of $Z_0 = 50\Omega$ then find the following, assuming the TL operating at 300 MHz with length 0.1 λ;
(i) Reflection coefficient Γ_L and VSWR at the load, position of the first voltage maximum d_{max} and minimum d_{min} from the load, and the input impedance Z_{in}.
(ii) Design a single stub tunner to match the load to TL assuming **series** stub.

Constants: $\epsilon_0 = 8.854 \times 10^{-12}$ F/m, $\mu_0 = 4\pi \times 10^{-7}$ H/m.

Good Luck

Dr. Hussein E. Seleem