TE/Mech/Elc/ETRX/COM/EXTC Sem V
Environmental Studies

28/12/10

Con. 6493-10. **(REVISED COURSE)** **GT-3639**

(2 Hours) **[Total Marks : 50**

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from question Nos. **2** to **7**.

1. Solve any **five** :— 10
   (a) What is acid rain ? Give two effects of acid rain.
   (b) Differentiate between Bioprospecting and Biopiracy.
   (c) Write note on Cyclone Mitigation.
   (d) Name the fundamental principles of the environment.
   (e) Distinguish between Nuclear Fission and Nuclear Fussion.
   (f) Explain the term Sustainable Development.

2. (a) Give an account of Women and Child Welfare in India. 5
   (b) Discuss the causes and effect of Global Warming. 5

3. (a) Discuss the effect of Water Pollution. 5
   (b) Discuss the role of information technology in environment and human health. 5

4. (a) Short note on public awareness about the environment. 5
   (b) Explain Soil Errosion. How it happened give its types. 5

5. (a) What is Noise ? Describe briefly the effect of noise on human health. 5
   (b) Write an essay on Disaster Management. 5

6. (a) Give the effect of deforestation. 5
   (b) Describe the grassland and forest ecosystem. 5

7. (a) Give the fifteen principles of Environmental Education. 5
   (b) Explain the benefits of biological diversity. 5

TE/EXTC/Sem II/Rev

Principles of Control Sys.

21/12/10

P4–Exam.–Oct.–10–62

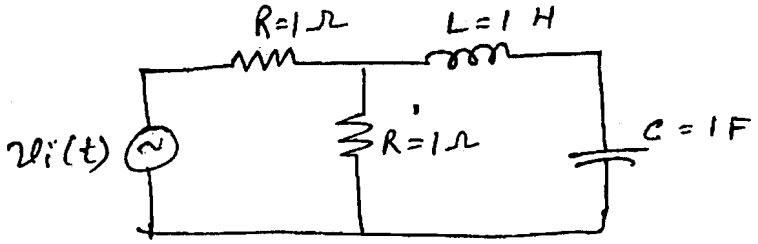
Con. 5524–10. **(REVISED COURSE)** **GT–6759**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) **Illustrate** answers with **sketches** wherever **required**.

1. (a) Explain the relationship between poles and system dynamic response. **5**
   (b) Define sensitivity. How can we reduce sensitivity of closed loop system ? **5**
   (c) Compare the two stability methods : **5**
   (i) Root-locus (ii) Routh's criterion.
   (d) Give advantages of Nyquist plot. **5**

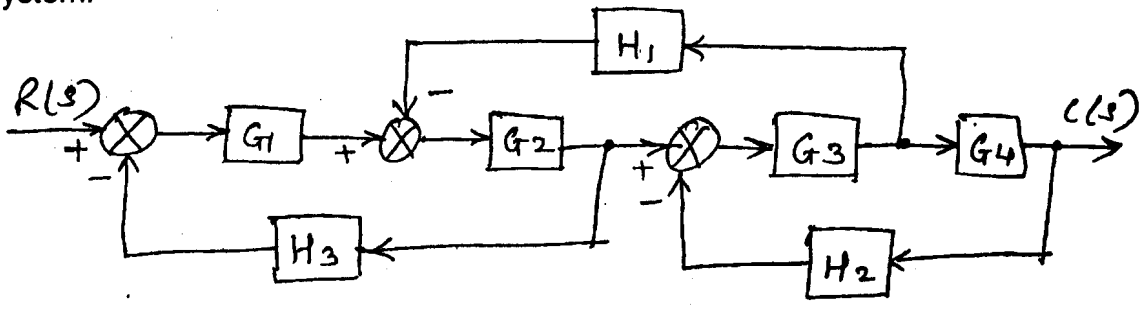
2. (a) For the given electrical system **10**



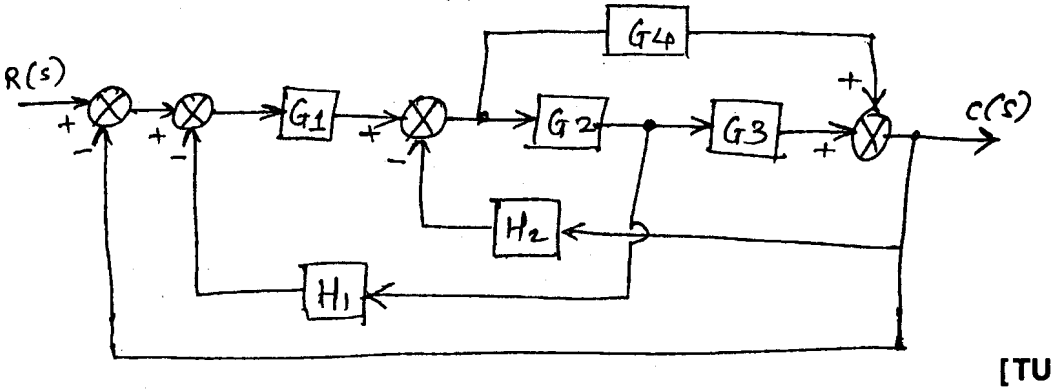
Determine :–
(i) Transfer function model
(ii) State variable model.

(b) Explain the effect of an additional zero and additional pole to the standard second order system. **10**

3. (a) Using block diagram reduction method obtain the transfer function of the given system. **10**



(b) Consider the following block diagram shown. Draw its equivalent signal flowgraph and find the transfer function $\frac{C(s)}{R(s)}$ using Mason's Gain Rule. **10**



[TURN OVER

4. (a) Derive and analyse the response of a second order system to unit step input. With the help of graphical plots explain the significance of damping ratio for its various values. **10**

(b) Derive steady-state errors for various standard inputs. Explain the relation between steady-state error and TYPE of the system. **10**

5. (a) Using Routh's stability criterion :– **10**

(i) Find range of K for stability of given system and frequency of oscillations.
$s^4 + 9s^3 + 26s^2 + 24s + K = 0$

(ii) Determine the number of roots on the imaginary axis for
$s^5 + 6s^4 + 15s^3 + 30s^2 + 44s + 24 = 0$.

(b) Determine the value of K for unity feedback control system whose open loop transfer function is given as, **10**

$$G(s)\,H(s) = \frac{K}{s(s+2)(s+4)}$$

(i) Phase Margin = 60°
(ii) Gain Margin = 20 db.

6. (a) The open-loop transfer function of a feedback system is **10**

$$G(s)\,H(s) = \frac{K}{s(s+6)\left(s^2+4s+13\right)}$$

Draw the complete root locus.

(b) Draw Bode plot for **10**

$$G(s)\,H(s) = \frac{4}{s\left(s^2+16s+4\right)}$$

Obtain gain crossover frequency, phase crossover frequency, gain margin and phase margin.
Also comment on stability of the system.

7. Write short note on (any **two**) :– **20**

(a) Error compensation technique and their effects on system performance.
(b) Armature controlled dc servomotor.
(c) Stepper motor construction and use in control systems.

Mha I -10 98

TE / EXTC / Sem V / old

21/12/10

Con. 5523-10.

(OLD COURSE)

GT-6984

Communication Circuits.

(3 Hours)

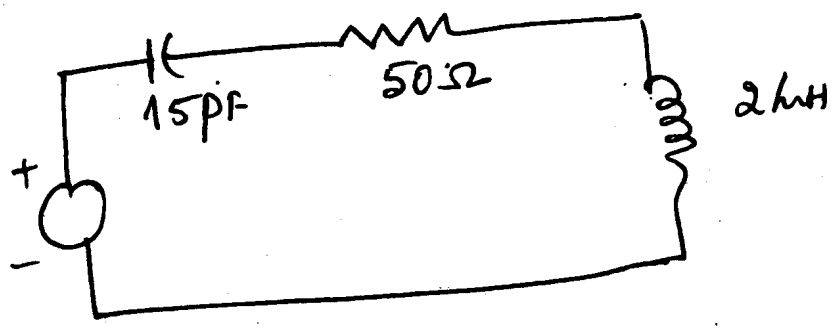
[Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions of the remaining **six** questions.
(3) Assume **suitable** data and justify.

1. Answer the following questions (any **four**) :– **20**
   (a) A receiver is connected to an antenna whose resistance is 50 Ω. It has an equivalent noise resistance of 30 Ω. Calculate the receiver noise figure in dBs and its equivalent noise temperature.
   (b) Explain the method of impedance matching using reactive networks over a narrow frequency range.
   (c) Discuss different methods for reducing switching time of a frequency synthesizer.
   (d) For a filter describe 'Group delay' and phase delay. What is their importance ? How a phase response of a filter can be linearised ?
   (e) Describe LM 380 as phono-amplifier.

2. (a) A first order PLL is to be used to synthesise a 1 MHz signal from a 50 KHz reference frequency. The phase detector gain is 2V/rad, the VCO sensitivity is 100 Hz/V and the free running frequency of the VCO is 1 MHz. Estimate the rise time of the system. What will be the rise time if it is desired to realize an output frequency of 1, 2 MHz. **10**
   (b) With a neat block, explain the working of DDFS. State the uses of frequency synthesizer. **10**

3. (a) What is a hybrid transformer ? For the hybrid transformer circuit, derive the condition so that the transformer is biconjugate. **10**
   (b) For the circuit shown below, calculate :— **10**
      (i) Q of the coil
      (ii) Resonant frequency
      (iii) Bandwidth.



4. (a) Derive an expression for output voltage of a double balanced mixer. Justify how it is better than other switching type mixer. **10**
   (b) Explain the characteristics of RCA 3040 video amplifier with neat diagram. **10**

[TURN OVER

5. (a) Derive expression for resistance and capacitance of capacitive transformer and show that the turns ratio is $\left(1 + \frac{c_1}{c_2}\right)$. 10

(b) For PLL synthesizer $K_v = 10\pi$ rad/sec. The close loop bandwidth is 10π rad/sec. Design low pass filter should be used so that the closed loop system approximate a second order Butterworth filter. Damping ratio $\rho = 0{\cdot}707$. 10

6. (a) Design a lossless coupling network that matches a load of $(12 + j5)\ \Omega$ to a $40\ \Omega$ source impedance at 20 MHz. 10

(b) A crystal has following parameters— 10

$L = 0{\cdot}33\ \mu H$. $C_s = 0{\cdot}065$ pF. $C_{in} = 1\ \rho F$, $R = 5{\cdot}5\ K\ \Omega$

(i) Find series resonant frequency.

(ii) Find the percentage by which the parallel resonant frequency exceeds the series resonant frequency.

(iii) Find Q of the circuit.

7. Write short notes on :– 20

(a) Frequency selective circuit

(b) Impedance matching using reactive network

(c) Anti symmetric three winding transformer

(d) Phono amplifier.

T.E. Electronic & tele sem V/old

Computer Architecth Organisation.

P4-Con No-13

Con. 5515–10. **(OLD COURSE)** **GT–6982**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.

1. (A) Explain the virtual memory concept with reference to segmentation and paging. **10**

   (B) Explain Flynn's classification of parallel processing systems. **10**

2. (A) Explain Booths algorithm for multiplication of signed numbers. **10**

   (B) Explain with neat diagram the datapath of a floating point ALU. **10**

3. (A) Explain CPU organization with references to general registers, instruction types, formats and addressing modes. **10**

   (B) Compare and contrast RISC and CISC computers. **10**

4. (A) Distinguish Hardwired and microprogrammed control unit. **10**

   (B) Explain I/O processor in detail. **10**

5. (A) List different Cache memory mapping techniques and explain any one technique. **10**

   (B) (i) Distinguish SRAM and DRAM. **5**

   (ii) With the help of block diagram concept of DMA. **5**

6. (A) Explain Interrupt driven I/O and Programmed I/O with example. **10**

   (B) Explain steps involved in design of ALU with example. **10**

7. Write notes on any **two** **20**

   (A) Bus arbitration.

   (B) Pipeline Processor.

   (C) Memory hierarchy.

TE/ ExTc/ Sem V/ Rev
R.F. Circuit Design.

190 : 2ndhf10Cmk

Con. 6032-10. **(REVISED COURSE)** **GT-6756**

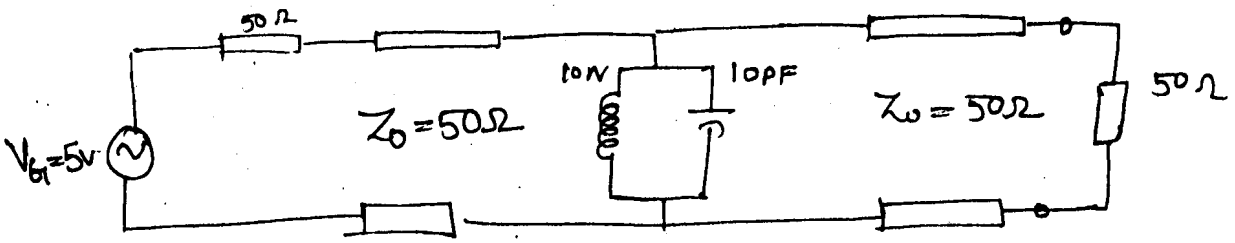
(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any **suitable** data wherever **required** and **justify**.
(4) **Figures** to the **right** indicate **marks**.

1. (a) Compute the skin depths for copper, aluminium at 1 GHz and 10 GHz and find the resistance of a 10 cm wire with diameter of 1 mm :— **6**
$\sigma_{cu} = 64{\cdot}516 \times 10^6$ s/m
$\sigma_{Al} = 40 \times 10^6$ s/m.
(b) A transmission line of characteristic impedance $Z_o = 50\ \Omega$ and length $d = 0{\cdot}15\ \lambda$ is terminated into a load impedance of $Z_L = (25 - j30)\ \Omega$. **6**
Find Γ_o, $Z_{in}(d)$ and SWR by using Z-Smith chart.
(c) Draw the lumped element circuit model for a transmission line. Derive the expression for voltage and current travelling waves. **4**
(d) Draw the equivalent circuit and find the odd and even mode parameters for coupled transmission line. **4**

2. (a) Design a low-pass filter whose input and output are matched to a 50 Ω impedance with cut-off frequency of 3 GHz, equi-ripple of 0·5 dB and rejection of atleast 40 dB at approximately twice the cut-off frequency. Assume a dielectric material that results in a phase velocity of 60% of the speed of light. **12**
(b) With the help of suitable derivation, explain power considerations for a transmission line. **8**

3. (a) For a filter circuit shown :— **10**



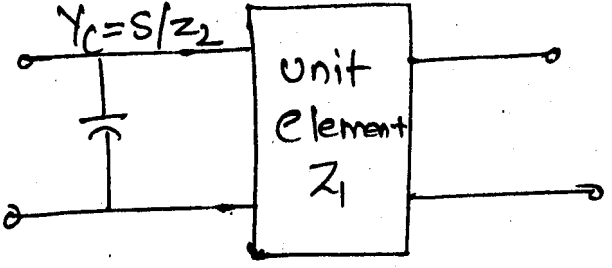
Find the loaded, unloaded and external quality factors.
(b) For a transmission line circuit involving source and load terminations of $Z_G = 60\ \Omega$ and $Z_L = 50\ \Omega$ respectively and $Z_O = 75\ \Omega$, compute the input power and power delivered to the load. Assume length of line to be $\lambda/4$ with source of $V_G = 8$ V. **10**

4. (a) Explain different types of diode models (RF) and differentiate them with respect to junction capacitance, band gap energy and conductance. **10**
(b) Draw the Ebers-Moll model of large signal BJT and explain in detail the transport representation and injection form. **10**

4. (a) Explain different types of diode models (RF) and differentiate them with respect to junction capacitance, band gap energy and conductance. **10**

   (b) Draw the Ebers-Moll model of large signal BJT and explain in detail the transport representation and injection form. **10**

5. (a) Define unit element and find the ABCD parameters for the following circuit using Kuroda's identity. **10**



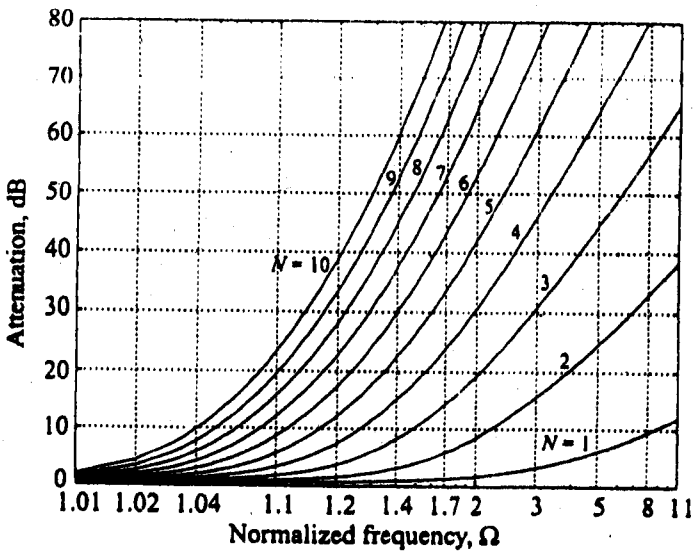
(b) Explain the construction and operation of HEMT and RF field effect transistor. **10**

6. (a) Explain the role of scattering parameters and its properties at RF and microwaves. **10**
   (b) Explain RF behaviour of high frequency resistor, capacitor and inductors. **10**

7. Write short notes on the following :— **20**
   (a) Microstrip transmission lines
   (b) Parallel and series connections and its importance in RF design
   (c) DC characterization of Bipolar junction transistor
   (d) Physical properties of semiconductor.

Chebyshev filter coefficients; 0.5 dB filter design (N = 1 to 10)

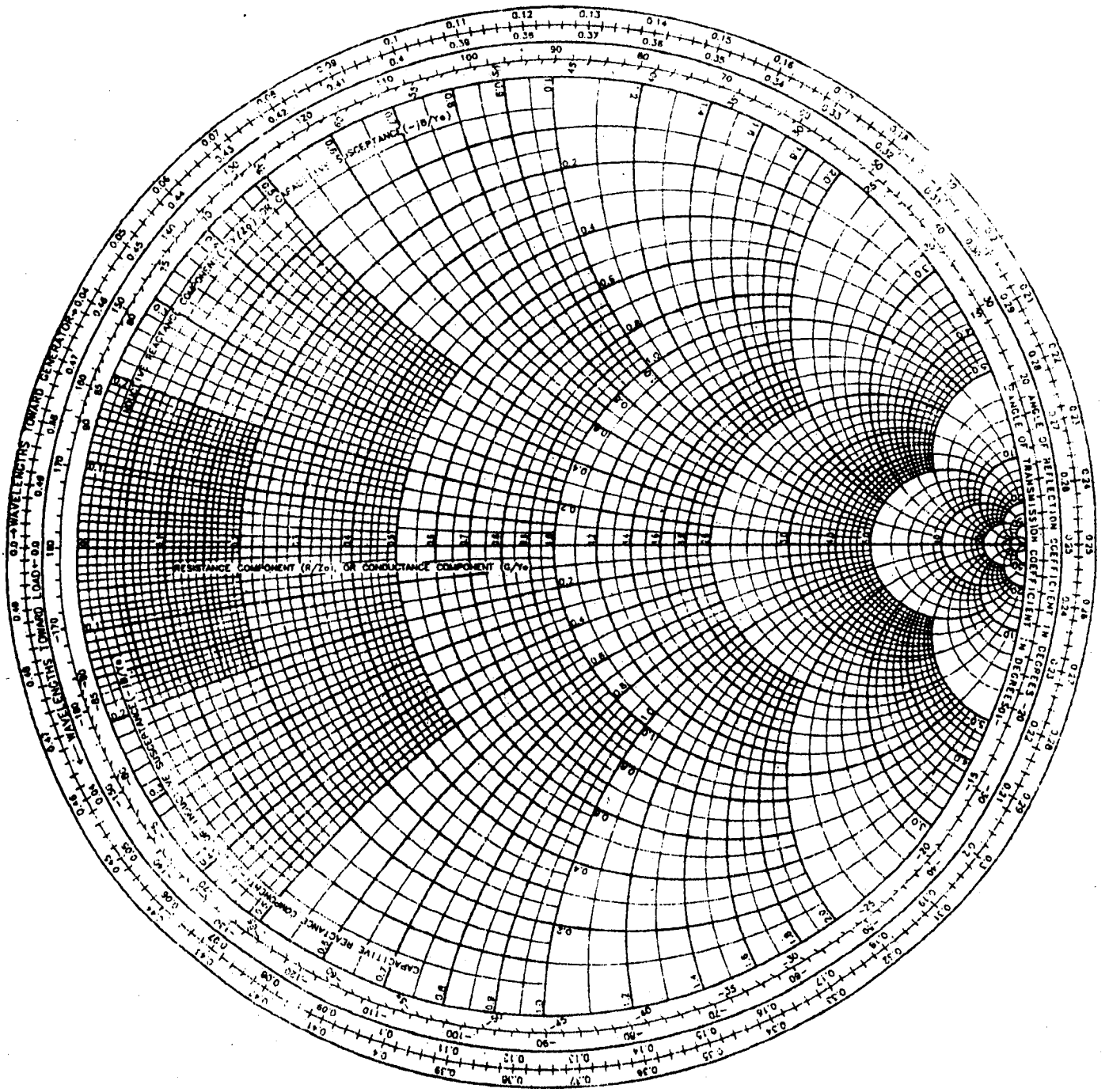
N	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}	g_{11}
1	0.6986	1.0000									
2	1.4029	0.7071	1.9841								
3	1.5963	1.0967	1.5963	1.0000							
4	1.6703	1.1926	2.3661	0.8419	1.9841						
5	1.7058	1.2296	2.5408	1.2296	1.7058	1.0000					
6	1.7254	1.2479	2.6064	1.3137	2.4758	0.8696	1.9841				
7	1.7372	1.2583	2.6381	1.3444	2.6381	1.2583	1.7372	1.0000			
8	1.7451	1.2647	2.6564	1.3590	2.6964	1.3389	2.5093	0.8796	1.9841		
9	1.7504	1.2690	2.6678	1.3673	2.7939	1.3673	2.6678	1.2690	1.7504	1.0000	
10	1.7543	1.2721	2.6754	1.3725	2.7392	1.3806	2.7231	1.3485	2.5239	0.8842	1.9841

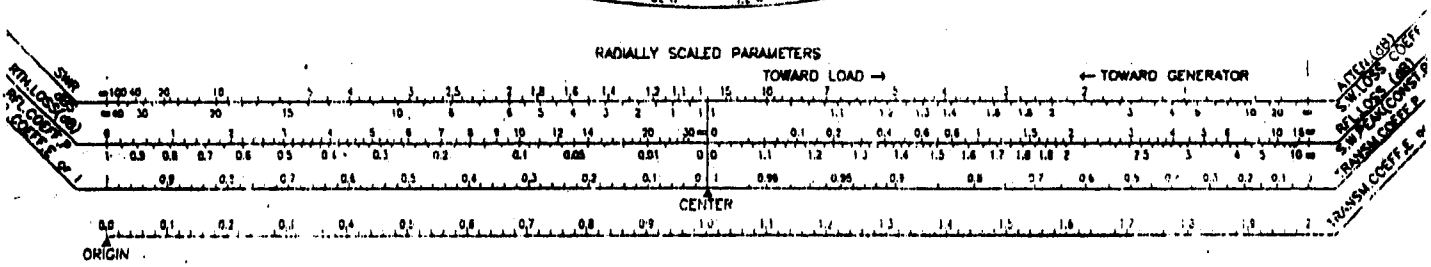


Attenuation response for 0.5 dB Chebyshev design.

NAME	TITLE	DWG. NO. A
SMITH CHART FORM 82-8SPR(9-66)		DATE

IMPEDANCE OR ADMITTANCE COORDINATES





TE/ EXTC / Sem V / old
E of MP.

Con. 5534-10. Elements of Microprocessor **GT-6987**

(OLD COURSE)

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.

1. (a) Explain control signal generation for 8085 when it is to be interfaced with I/O peripherals and memory. **5**
   (b) Explain I/O mapped I/O and memory mapped I/O for microprocessor. **5**
   (c) Discuss segmentation for 8086 in detail with examples. **5**
   (d) Discuss types of subroutines with at least one example of each. **5**

2. Design a single board computer with following specifications :— **20**
   (a) 8085 microprocessor
   (b) 16 KB of SRAM using 8 KB devices
   (c) 16 KB of EPROM using 4 KB devices
   (d) Two, inpute-output ports, both interrupt driven.
   Show clearly memory mapping and I/O mapping. Explain decoding logic used.

3. (a) Draw timing diagram for following 8085 instructions :— **10**
      (i) LXI H_1 3060 h
      (ii) OUT 40 h
   (b) Define stack and subroutine. Give various ways of parameter passing to subroutines with examples. **10**

4. (a) Explain serial communication of 8085 in detail. **10**
   (b) Explain ICWs and OCWs of PIC 8259. **10**

5. (a) Explain maximum mode operation of 8086. **10**
   (b) List all string instructions of 8086 and explain. **10**

6. (a) Write an assembly language program to find number of positive and negative numbers in an array of 20 elements. (Use 8085 instruction set). **8**
   (b) Discuss mixed language programming. **6**
   (c) Give addressing modes of 8086 with atleast one example. **6**

7. (a) Draw interfacing diagram of PIT 8254 with 8085 and explain modes of PIT 8254. **10**
   (b) Explain DMA 8257 operation with various ways of data transfer. **10**

TE/ EXTC/ Sem V
MP & MC I

VT-Oct-10-18

Con. 5703–10. **(REVISED COURSE)** **GT–6762**

(3 Hours) **[Total Marks : 100**

Microprocessors & microcontrollers - I

N.B. : (1) Question **No. 1** is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.

1. (a) Interface 4K byte ROM and 8K byte R/W memory for 8085 based microcomputer system using (4K × 4) EPROM chips and RAM (2K × 8). Draw memory map, address bit map and exhaustive decoding logic circuit. **12**
   (b) Write ALP to convert five packed BCD bytes to unpacked BCD bytes for 8085 based microcomputer. **8**

2. (a) Draw and explain interrupt structure of 8085 microprocessor. **10**
   (b) Write program to generate square wave of 1 KHz on SOD pin of 8085 microprocessor. Also write delay subroutine using 8253 counter operate at 30 KHz frequency. **10**

3. (a) Draw and explain handshake modes of 8155 with suitable diagram. **10**
   (b) It is required to interface Eight Comman anode seven segment display with 8085 through 8255 PPI. Draw interfacing diagram and write ALP to display "WEL-DONE" Massage. **10**

4. (a) Draw internal structure of TCON and TMOD SFR and explain it. **10**
   (b) Explain PSW of 8051 Microcontroller with example for each Alog bit. **10**

5. (a) Explain various addressing modes of ARM controller with suitable example. **10**
   (b) Explain following instruction of ARM. Controller :– **10**
      (i) BCC up
      (ii) RSB Rd, Rs_1, Rs_2
      (iii) MLA R_4, R_3, R_2, R_6
      (iv) SWP R_1, R_2, [R_3]
      (v) CDP P_4, 3, C_{12}, C_{13}, C_3, 4.

6. (a) Write program for 8051 microcontroller to multiply two 8 bit numbers stored in external memory locations 3000H and 3001H. Send the result on port 1 and port 3. **10**
   (b) Explain Internal memory organization of 8051 microcontroller. **10**

7. Write short note on :– **20**
   (a) Salient features of 89C51, 89C52, 89C2051 and 89C2052
   (b) Stepper motor interfacing with 8051 microcontroller
   (c) Memory access and branching instructions of ARM Controller.

T.E. Electronic & Telecommunication
Sem V Rev

Con. 6198-10. Random Signal Analysis **GT-6753**

(REVISED COURSE)

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** from **remaining** questions.
(3) Assume **suitable data** wherever **necessary** and **state** it **clearly**.

1. (a) State and Explain central limit theorem. **20**

(b) (i) State Axiomatic definition of probability.
(ii) If X and Y are independent random variables show that $E[XY] = \mu_x \mu_y$ where $\mu_x = E[X]$ and $\mu_y = E[Y]$.

(c) Define strict sense stationary and WSS random process.

(d) Define Markov Chain. State any two application areas of Markov Chains.

2. (a) Define random variable, explain with suitable example. State the conditions for a function to be a random variable. **10**

(b) Let $X_1, X_2, \ldots$ be a sequence of random variables. **10**
Define : (i) convergence almost everywhere
(ii) convergence in Probability
(iii) convergence in mean square sense
(iv) convergence in Distribution
for the above sequence to a random variable X.

3. (a) Define random process. Give example of a random process. Show few member functions. Define first and second order distribution and density functions for a random process. **10**

(b) The signal Z at the input of an amplifier consists of a signal X to which is added random noise Y. Thus $Z = X + Y$. If X is also a random variable. **10**
(i) Determine the pdf of Z.
(ii) If X and Y are independent then what is the pdf of Z ?

4. (a) In a communication system, a zero is transmitted with probability 0·4 and a one is transmitted with probability 0·6. Due to noise in the channel, a zero can be received as one with probability 0·1 and as a zero with probability 0·9, similarly one can be received as zero with probability 0·1 and as a one with probability 0·9. Now— **10**
(i) A one is observed, what is the Probability that zero was transmitted.
(ii) A one is observed, what is the Probability that a one was transmitted.

(b) In Medical imaging such as computer tomography the relation between detector reading y and body absorptivity x follows a $y = e^x$ law. Let X be $N(\mu, \sigma^2)$. Compute the pdf of y. **10**

5. (a) Define n-step transition probability for a Markov Chain. Derive Chapman-Kolmogorov equation. 10

(b) Consider the random process— 10

$$X(t) = A \sin (w_0 t + \theta)$$

where A and θ are independent, real-valued random variables and θ is uniformly distributed over $[-\pi, +\pi]$. Find the mean $\mu_x(t)$ and Autocorrelation function $R_{xx}(t_1, t_2)$ of X(t).

[TURN OVER

6. (a) A WSS random process x(t) with autocorrelation— 10

$$R_{xx}(\tau) = Ae^{-a|\tau|}$$

where A and a are real positive constants, is applied to the input of an LTI system with impulse response $h(t) = e^{-bt}\,u(t)$, where b is a real positive constant. Find the autocorrelation of the output Y(t) of the system.

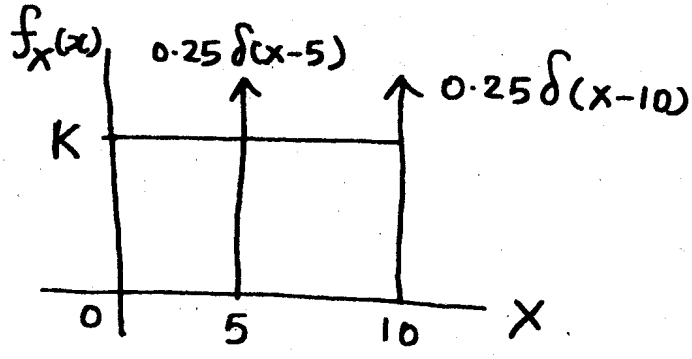
(b) In the photoelctric detector, Let Y be the number of photoelectrons produced in time τ, depends on the (normalized) incident energy X. If X were constant, say X = x, Y would be a poisson random variable with parameter x but as real light sources except for gain stabilized lasers – do not emit constant energy signals, X must be treated as a random variable. In certain situations the pdf of X is accurately modeled by— 10

$$f_X(x) = \begin{cases} \frac{1}{\mu_x} \exp\left(\frac{-x}{\mu_x}\right), & x \geq 0 \\ 0, & x < 0 \end{cases}$$

where $\mu_x = E[x]$

Compute E[Y].

7. (a) The pdf of a random variable is shown— 10



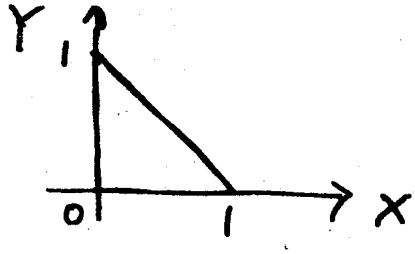
(i) Find the value of constant K.

(ii) Compute $P[X \leq 5]$ and $P[5 \leq X < 10]$.

(b) The joint probability density function of (x, y) is given by— 10

$$f_{XY}(x, y) = C\,(1 - x - y)$$

for values of x and y for which (x, y) lies within the triangle as shown—



outside the triangle $f_{XY}(x, y) = 0$.

Find : (i) C

(ii) $f_X(x)$

(iii) $f_Y(y)$.

TE | ExTC | Sem V | Rev
Signal & System

Con. 6361-10. **(REVISED COURSE** **GT-6765**

(3 Hours) **[Total Marks : 100**

N.B.:(1) Question No. **1** is **compulsory**.
(2) Attempt any **four** from remaining **six** questions.
(3) Assume any **suitable** data if **necessary** and state it **clearly**.

1. (a) A continuous time linear system S with input x(t) and output y(t) yields the following input output pairs : **20**

$$x(t) = e^{j2t} \xrightarrow{S} y(t) = e^{j3t}$$
$$x(t) = e^{-j2t} \xrightarrow{S} y(t) = e^{-j3t}$$

If x(t) = cos(2t), determine the corresponding output y(t) for system S.

(b) Let x[n] = u[n] – u[n –5]. Find and sketch even and odd parts of x [n].

(c) Find the Z-transform of the signal x[n] = – a^n u[–n –1]. Draw Pole-zero plot and show ROC.

(d) A Discrete time system has the form

$$y[n] = x[n] + \alpha x [n - D]$$

Draw the realization for this system.
Is this system IIR ? Explain.
(Assume α and D are constants)—

2. (a) The analog signal x(t) is given by— **10**

$$x(t) = 2\cos(2000\pi t) + 3\sin(6000\pi t) + 8\cos(12000\pi t)$$

Calculate :
(i) Nyquist sampling rate.
(ii) If x(t) is sampled at the rate F_s = 5KHz.
What is the discrete time signal obtained after sampling ?
(iii) What is the analog signal y(t) we can reconstruct from the samples if ideal interpolation is used ?

(b) The periodic square wave is defined as— **10**

$$x(t) = \begin{cases} 1, & |t| < T_1 \\ 0, & T_1 < |t| < \dfrac{T}{2} \end{cases}$$

This signal is periodic with fundamental period T and fundamental frequency

$$w_0 = \frac{2\pi}{T}$$

Determine exponential fourier series coefficients for x(t).

3. (a) Let $x(t) = 1{\cdot}5\ t, \quad 0 \leq t < 2$
$= 0, \quad$ elsewhere **10**

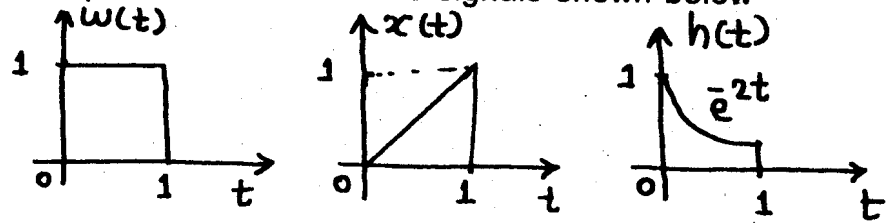
Sketch (i) $x(t)$ (ii) $f(t) = 1 + x(t-1)$ (iii) $g(t) = x(1-t)$
(iv) $h(t) = x(0{\cdot}5t + 0{\cdot}5)$ (v) $w(t) = x(-2t + 2)$

(b) The periodic impulse train is given by— **10**

$$x(t) = \sum_{k=-\infty}^{+\infty} \delta(t - KT)$$, is periodic with period T.

Find — (i) exponential fourier series coefficients a_k
(ii) fourier transform of x(t). Comment on the result.

4. (a) Find the Laplace transform of the signals shown below **10**



(b) State and discuss the properties of the region of convergence for the z–transform.

5. (a) Solve the following difference equation using z–transform method.
$x[n+2]+3x[n+1]+2x[n] = 0$
Where the initial conditions are
$x[0] = 0$ and $x[1] = 1$.

(b) Let $y[n]$ denote convolution of $x_1[n]+x_2[n]$ and $h[n]$ i.e.

$$y[n]=(x_1[n]+x_2[n]) * h[n]$$

$$\text{let } x_1[n]=\left(\frac{1}{2}\right)^n u[n] \text{ and } x_2[n]=2^n u[-n]$$

Find $y[n]$ if $h[n]=u[n]$.

6. (a) A system is described by following difference equation— 1

$$y[n]=\frac{3}{4}y[n-1]-\frac{1}{8}y[n-2]+x[n]+\frac{1}{2}x[n-1]$$

Draw — (i) Direct form I realization
(ii) Direct form II rea ization

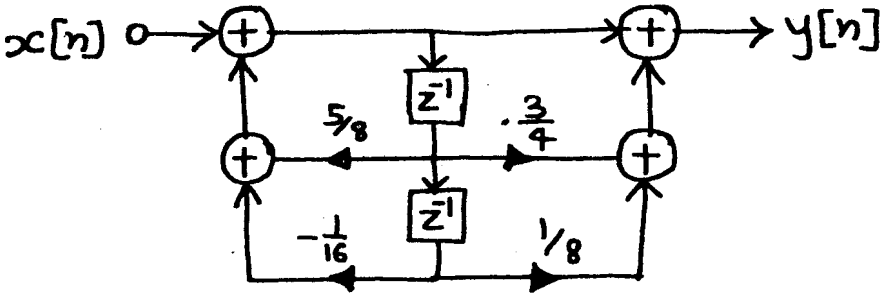
(b) Consider the state variable model of a second order system— 1

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 2\end{bmatrix}u$$

$$\begin{bmatrix}x_1(0)\\ x_2(0)\end{bmatrix}=\begin{bmatrix}0\\ 1\end{bmatrix}; \; u=\text{unit step}$$

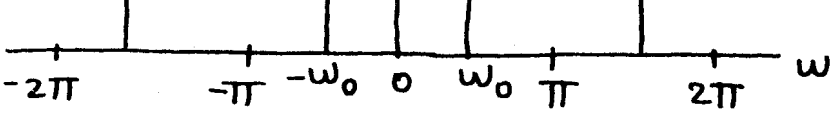
Find — (i) State transition matrix
(ii) State response x(t), t > 0.

7. (a) **Figure** shows a direct form II realisation of a system 1



(i) Obtain transfer function H(z)
(ii) Draw pole zero diagram
(iii) Obtain difference equation.

(b) Consider the discrete-time ideal lowpass filter frequency response $H(e^{jw})$ as shown below. 1



Impulse response and frequency response of an LTI system are a fourier transform pair. Determine and sketch impulse response of the ideal LPF from the frequency response shown.

TE / ExTC / Sem V / old

Element of Microelectronics

Con. 6210-10. **(OLD COURSE)** **GT-6990**

(3 Hours) **[Total Marks : 100**

N.B.: (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions out of remaining **six** questions.
(3) Assume **suitable** data wherever **necessary** and mention the **same**.

1. Solve any **four** from the following :— **20**
   (a) Explain parasitic capacitances of MOSFET.
   (b) Differentiate between ion implantation and diffusion process.
   (c) Explain CMOS latch up
   (d) What is body bias effect in MOSFET ? How it will affect MOSFET characteristics ?
   (e) What are different types of IC Resistors ? Explain fabrication of one of them.

2. (a) Explain float zone single crystal growth process. **10**
   (b) Explain transient response of CMOS Inverter. **10**

3. (a) Draw stick diagram and mask layout of two input CMOS NOR gate using λ design rules. **10**
   (b) Explain with neat diagrams fabrication process of Bipolar Junction Transistor. **10**

4. (a) Explain MOSFET operation in detail. **10**
   (b) What is photolithography technique ? Explain patterning of oxide using photolithography technique. **10**

5. (a) Explain operation of CMOS inverter with the help of transfer characteristics. **10**
   (b) What are different types of MOSFET scaling ? Explain one of them in detail. **10**

6. (a) Explain with help of neat sketches fabrication process of CMOS inverter. **10**
   (b) Calculate threshold voltage V_{To} at $V_{SB} = 0$, for a polysilicon gate n-channel MOSFET with the following parameters : **10**
   Substrate doping density NA = $10^{16}cm^{-3}$,
   Polysilicon gate doping density $N_D = 2 \times 10^{20}cm^{-3}$,
   Gate oxide thickness t_{ox} = 500 A°, and
   Oxide interface fixed charge density $N_{ox} = 4 \times 10^{10}cm^{-2}$,

   Data : $\frac{kT}{q} = 26\,mV$,
   $ni = 1{\cdot}45 \times 10^{10}cm^{-3}$, $\varepsilon_{si} = 11{\cdot}7 \times \varepsilon_o$
   $\varepsilon_{ox} = 3{\cdot}9 \times \varepsilon_o$, $\varepsilon_o = 8{\cdot}85 \times 10^{-14}$ F/cm.

7. Write short notes on any **four** of the following :— **20**
   (a) EDA tools used in VLSI Technology
   (b) Butting and buried contact
   (c) IC Cross overs
   (d) TTL NAND gate
   (e) Short channel effects.

Con. 5636-10. GT-6978

(OLD COURSE)

T.E. / EXTC / Sem-V / Old

(3 Hours) [Total Marks : 100

Filtery Theory

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from Question Nos. **2** to **7**.
(3) Assume **suitable data** if **required** with proper **justification**.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) What are the advantages and limitations of active and passive filters ? 7
(b) List the advantages and applications of switch-capacitor filter. 7
(c) Explain Biquadratic function. 6

2. (a) Synthesize the following transfer function— 10

$$Y_T(s) = \frac{HS^2}{s^3 + 2s^2 + 2s + 1}.$$

Identify private pole. Realize the above transfer function.
(b) List the properties of Butterworth and Chebyshev filter response. 10

3. (a) Determine the order of Butterworth response for the following specifications and realize the filter circuit :— 10
wp = 1 rad/sec kp = 3dB
ws = 2 rad/sec ks = 15 dB
(b) Explain the steps to construct a leap frog filter. Construct third order leap frog filter using the same steps. 10

4. (a) Find the order of Chebyshev magnitude function required to meet the following specifications :— 10
wp = 1 rad/sec kp = 0·5 dB
ws = 2·33 rad/sec ks = 20 dB
Determine transfer function and synthesize it for a termination in 1Ω.
Find cn(w) for this filter.
(b) Draw the circuit configuration for Generalized Impedance Converter(GIC). Analyse it and determine transmission parameters. 10

5. (a) Draw and explain Sallen and Key band pass filter. 10
(b) Draw and explain Infinite gain single amplifier band pass filter. 10

6. (a) Derive the expression for a state variable configuration using three op-amp. specify the expression for LP, HP and BP output. 10
(b) Draw and explain Tow Thomas filter. Derive expresion for Low pass and Band pass output. 10

7. Write notes on any **two** :— 20
(a) Akerberg-Mossberg filter.
(b) Frequency transformation.
(c) Properties of Inverse-Chebyshev function.