UNIT-1

Q.1 (a) What are different topologies used in LAN? Explain.
(b) Explain all categories of network.

OR

(a) What are different modes of communication? Explain each?
(b) What is TCP/IP protocol and how it is different from OSI model?

UNIT-2

Q.2 What is circuit switching? Discuss how packet switching is better than circuit switching for communication.

OR

(a) Explain the need of coding. Explain the block codes and their advantages?
(b) What is MODEM?

UNIT-3

Q.3 List at least three techniques used for error detection & correction. Discuss any one of them in detail.

OR

(a) What is stop & wait protocol? Explain.
(b) Find the CRC code for a frame 1010001101 & generator polynomial G(x) = (X^5+X^4+X^2+1).

UNIT-4

Q.4 Define Pure ALOHA & Slotted ALOHA & derive expression for their throughput.

OR

What is IEEE 802.11 standard? Explain.

UNIT-5

Q.5 (a) Explain FDMA with its characteristics. What is packet format and header format? Define each part of it.
(b) What is routing.

OR

What are networking devices? Explain each of them.
Unit -I
Que. 1 (a) Explain in detail seven layer ISO-OSI reference model for a computer network?
(b) What is communication & its types?

OR
(a) Explain necessity of data compression & how it is achieved. Explain any one method?
(b) What are different types of transmission modes? Explain

Unit -II
Que. 2 (a) Explain in terms of data link control & physical layer concepts how error & flow control are accomplished in synchronous TDM.
(b) What is CM & CMTS?

OR
(a) What is multiplexing? Briefly explain FDM & TDM multiplexing along with their advantages & disadvantages.
(b) What is datagram approach?

Unit -III
Que. 3 What is DSL? What are its different types? Explain ADSL in detail?

OR
(a) What is go-back n protocol & ARQ Protocol?
(b) What is minimum hamming distance?

Unit -IV
Que. 4 (a) Write short note on CSMA/CD.
(b) What are multiple access methods? Briefly explain each of them.

OR
(a) What is Bluetooth Architecture?
(b) Explain MAC.

Unit -V
Que. 5 What do you mean by IPv6? What enhancements have been included in IPv6 over IPv4?

OR
(a) What is multicast routing protocol?
(b) Define token bus and token ring.

EC- 602
CELLULAR & MOBILE COMMUNICATION
Duration: 3 hours Max. Marks: 100
Note: Attempt all questions. All questions carry equal marks.

Unit – 1
Q1. (a) Discuss the categories in which we specify the performance criteria of mobile system?
(b) Discuss what is co-channel interference reduction factor?

OR

Q2. (a) Draw the block diagram of GSM architecture used and explain each block in detail?
(b) Explain the propagation attenuation and fading in mobile in normal radio mobile environment?

Unit-2

Q1. (a) Explain how diversity receiver reduces interference?
(b) Design a directional antenna system in K = 4 cell pattern?

OR

Q2 (a) Explain the designing of the Omni directional antenna under the worst case condition for K=7, K=12 and K=19 with all the suitable values and explaining each of them?
(b) Explain the effect on coverage and interference by applying power decrease antenna heights decrease and beam tilting?

Unit-3

Q1. (a) Derive the expression of received power if the signal is received by the directed path and ground reflected path?
(b) Derive the expression for the transfer function of the propagation channel in mobile to mobile propagation?

OR

Q2. (a) Derive the formula for received power in propagation over water or flat open area. Find the value of $\Delta f$ for different five cases of received power?
(b) How we obtain path loss from a point to point prediction model?

Unit-4

Q1. (a) Explain non fixed channel assignments algorithms?
(b) Write the expression for blocking probability for originating calls in three cases of queuing of handoff?

OR

Q2 (a) Obtain the free space path loss formula from the transmitting end and at the receiving end?

Unit-5

Q1 Explain OSI model of GSM digital cellular system?

OR

Q2 Describe in brief TDD system, PDC, PCS?
Note: Attempt any five questions. All questions carry equal marks.

Q1 (a) Draw the block diagram of GSM architecture and define each block function.
     (b) What is fading in cellular system define each type of fading and prevention technique?

Q2 (a) what is handoff technique and also define the technique of CELL SPLITTING?
     (b) What is frequency reuse scheme define each part of reuse scheme?

Q3 (a) What do you understand by PN sequence use in CDMA system?
     (b) Explain the limitations of basic cellular mobile system?

Q4 (a) what multiplexing techniques use in GSM system?
     (b) Explain the power management in CDMA system?

Q5 (a) what is self – location scheme in mobile communication?
     (b) Explain how lowering the threshold level of a received signal increase the coverage area?

Q6 (a) Why direction antenna is used for interference reduction?
     (b) Discuss about fixed assignment scheme?

Q7 (a) Discuss the Lee’s point to point model?
     (b) Design the direction antenna for K=7?

Q8 Write short note on following:—
     (a) Foliage loss
     (b) Diversity
     (c) Signaling format
     (d) Call processing

EC- 603 : DIGITAL SIGNAL PROCESSING

Duration: 3 hours Max. Marks: 100

Note: Attempt one question from each unit. All Questions carry equal marks.

UNIT-1

Q.1  (a) Determine whether the following system are linear time invariant:
     i. \( y(n) = x^2(n) \)   iii. \( y(n) = e^{x(n)} \)
     ii. \( y(n) = \sum_{k=-\infty}^{n} x(k) \)
     iv. \( y(n) = n \times x(n) \)
(b) Determine the output y(n) of a relaxed linear time invariant system with impulse response:

\[ h(n) = a^n u(n), \quad |a| < 1 \]

when the input is a unit step sequence that is x(n) = u(n).

Q.2 (a) Determine the total response y(n), n ≥ 0 to the difference equation:

\[ y(n) + a_1 y(n - 1) = x(n) \]

When x(n) is a unit step response x(n) = u(n) and y(−1) is the initial condition.

UNIT-2

Q.3 Determine the direct form II realization for each of the following LTI system

\[ 2y(n) + y(n - 1) - 4y(n - 3) = x(n) + 3x(n - 5) \]

\[ y(n) = x(n) - x(n - 1) + 2x(n - 2) - 3x(n - 4) \]

OR

Q.4 (a) Determine the z-transform of the following signals:

(b) Determine the convolution of the following pairs of the signals by means of the Z-transform:

i. \[ x_1(n) = \left(\frac{1}{4}\right)^n u(n - 1) \]

ii. \[ x_2(n) = \left[1 + \left(\frac{1}{2}\right)^n\right] u(n) \]

Q.5 (a) Compute the response of the system:

\[ y(n) = 0.7y(n - 1) - 0.12y(n - 2) + x(n - 1) + x(n - 2) \]

To the input x(n) = nu(n). Is the system stable?

(b) Determine the casual signal x(n) having the z-transform

i. \[ X(z) = \frac{z^{-6} + z^{-7}}{1 - z^{-1}} \]

ii. \[ X(z) = \frac{1}{(1 - 2z^{-1})(1 - z^{-1})^2} \]

UNIT-3

Q.5 (a) A finite duration sequence of length L is given as:

\[ x(n) = \begin{cases} 1, & 0 \leq n \leq L - 1 \\ 0 & \text{Otherwise} \end{cases} \]

Determine the N-point DFT if this sequence for N ≥ L.

(b) Obtain the DFT Sequence:

\[ x(n) = \{1, 0, -1, 2\} \]

OR

Q.6 (a) Perform the circular convolution of the following two sequences:
(b) Prove the circular time shift property of a DFT sequence.

UNIT-4

Q.7 Given input \( x(n) = \{1, 2, 3, 0\} \) and the system function \( h(n) = \{1, 2, 0, 0\} \). Use FFT method to calculate output \( y(n) \) using DIT algorithm for FFT.

OR

Q.8 Derive the signal flow graph for the N=16 point radix-4 decimation in frequency in which input sequence is in normal order and the computation is done in place.

UNIT-5

Q.9 (a) Discuss the bilinear transformation method for filter design.
(b) Explain Kieser, window technique for filter design.

OR

Q.10 (a) Discuss the impulse invariant method for filter design.
(b) Explain rectangular window technique for filter design.

EC- 603

DIGITAL SIGNAL PROCESSING

Duration: 3 hours                                                                                      Max. Marks: 100

Note: Attempt any five questions. All Questions carry equal marks.

Q.1 (a) Determine if the system described by the following input-output equations are linear, causal and time-invariant:
   i. \( y(n) = nx(n) \) ii. \( y(n) = Ax(n) + B \) iii. \( y(n) = e^{x(n)} \)

(b) Determine the response \( y(n) \), \( n \geq 0 \), of the system described by the second order difference equation:
\[
y(n) - 3y(n - 1) - 4y(n - 2) = x(n) + 2x(n - 1)
\]
when the input is a unit step sequence that is \( x(n) = 4^n u(n) \).

Q.2 (a) Determine the impulse response for the cascade of two linear time-invariant systems having impulse responses:
\[
h_1(n) = \left(\frac{1}{2}\right)^2 u(n) \quad \text{and} \quad h_2(n) = \left(\frac{1}{4}\right)^2 u(n)
\]

(b) Compute the convolution \( x(n) \) of the signals:
\[
x_1(n) = \{1, -2, 1\} \quad \text{and} \quad x_2(n) = \begin{cases} 1, & 0 \leq n \leq 5 \\ 0, & \text{elsewhere} \end{cases}
\]

Q.3 (a) Determine the z-transform of the following:
MODEL PAPER – May 2012

PCRT (Electronics & Communication Engg.)

i. \( x(n) = na^n u(n) \)

ii. \( x(n) = \begin{cases} 1, & 0 \leq n \leq N - 1 \\ 0, & \text{elsewhere} \end{cases} \)

iii. \( x(n) = u(-n) \)

(b) Determine the inverse z-transform of the following:

Q.4 (a) Determine the z-transform of the following signals:

i. \( \log(1 + az^{-1}), \quad |z| \geq |a| \)

ii. \( \frac{1}{1 + az^{-1}}, \quad |z| \geq |a| \)

(b) Compute the response of the system:

\[ y(n) = 0.7y(n - 1) - 0.12y(n - 2) + x(n - 1) + x(n - 2) \]

to the input \( x(n) = n u(n) \), Is the system Stable?

Q.5 (a) Compute the response of the system:

\[ y(n) = 0.7y(n - 1) - 0.12y(n - 2) + x(n - 1) + x(n - 2) \]

To the input \( x(n) = nu(n) \). Is the system stable?

(b) Determine the causal signal \( x(n) \) having the z-transform

i. \( X(z) = \frac{z^{-6} + z^{-7}}{1 - z^{-1}} \)

ii. \( X(z) = \frac{1}{(1 - 2z^{-1})(1 - z^{-1})^2} \)

Q.5 (a) A linear time invariant system is described by the following difference equation:

\[ y(n) = ay(n - 1) + bx(n) \quad 0 < a < 1 \]

i. Determine the magnitude and phase of the frequency response \( H(\omega) \) of the system.

ii. Choose the parameter \( b \) so that the maximum value of \( |H(\omega)| \) is unity and sketch \( |H(\omega)| \) and angle of \( H(\omega) \) for \( a = 0.9 \).

iii. Determine the output of the system to the input signal:

\[ x(n) = 5 + 12 \sin \frac{\pi}{2} n - 20 \cos \left( \pi n + \frac{\pi}{4} \right) \]

b) By means of DFT and TDFT, determine the response of the FIR filter. Determine the response of the FIR filter with impulse response

\( h(n) = \{1, 2, 3\} \uparrow \)

to the input sequence \( x(n) = \{1, 2, 2, 1\} \)

Q.6 (a) Distinguish between Decimation –in-Time and Decimation in Frequency algorithms.
Q.7 (a) Design the least-square FIR inverse of length 2 to the system with impulse response:

\[ h(n) = \begin{cases} 
-a, & n = 0 \\
1, & n = 1 \\
0, & \text{otherwise}
\end{cases} \]

Where \(|a| < 1\).

(b) What are the desirable features of finite response (FIR) digital filters? Mention some of its drawbacks. What is the reason that FIR filters are always stable?

Q.8 Write short notes on any three of the following:
(a) Linear phase FIR filters using windows
(b) Radix -2 FFT Algorithm
(c) Properties of the z-transform
(d) Causal and non-causal Systems

EC-604
MICROWAVE ENGINEERING

Duration: 3 hours
Max. Marks: 100

Note: All questions are compulsory. Each question contains internal choice. All questions carry equal marks.

Q.1 (a). Derive the expression for cutoff frequency for a TE11 mode in rectangular Waveguide.
(b). Distinguish between phase velocity and group velocity of a mode in a waveguide. Determine the velocity of energy in dominant mode of rectangular air filled waveguide at frequency 1.5 times the cutoff frequency.

Or
(a). Explain what is a resonant cavity. Derive the expression for resonant frequency of a rectangular waveguide.
(b). A rectangular waveguide with dimension 2.5cm x 1.0cm is to be operated at 15GHz to have dominate mode to exist. Calculate cutoff frequency, phase velocity and wave impedance.

Q.2 (a). Explain the principle and working of directional coupler.
(b). What is scattering matrix. Discuss the property of scattering matrix.

Or
(a). Explain the working and construction of magic tee with its application.
(b). What is isolator. Write its working principle, operation and application.

Q.3 (a). Give the working principle of varactor diode with its characteristic features. Also entitle its major application.
(b). Draw V-I characteristics of tunnel diode and explain its negative property. Give its lumped element equivalent circuit diagram also.
Or
(a) Explain the principle, working and application of the following.
   (1) LASER  (2) Gun Oscillator
(b) Explain the working of a parametric amplifier giving derivation of Manley–Rowe power relation.

Q.4  (a) Explain the working of two cavity klystron with the help of Applegate diagram.
     (b) What is traveling wave tube? Explain with its working principle and features.

Or
(a) Explain the working principle of reflex klystron.
(b) Explain the working principle of magnetron and write its operation.

Q.5  (a) Explain the principle working of following
     (1) VSWR Meter  (2) Bolometer
     (b) Explain a set up and procedure for measurement of scattering parameters of a two port network.

Or
(a) Explain the principle of power measurement bridges.
(b) Explain the arrangement of slotted line method of measurement of VSWR. What is the advantages of modulating microwave source by are 1 KHz signal in this measurement?

EC- 604
MICROWAVE ENGINEERING

Duration: 3 hours  Max. Marks: 100

Note: Attempt any five questions. All questions carry equal marks.

Q.1  The dominate mode field in an air filled wave guide has frequency which is 1.2 times the cut-off frequency. If the wave guide is short circuited at load end, calculate the distance between voltages zeroes in the wave guide. [The larger side of wave guide is 2.5cm]

Q.2  (a) Obtain the cut off frequency of modes in a circular wave guide.
     (b) Derive the expression for velocity of energy flow in dominant mode of rectangular wave guide.

Q.3  (a) Show that a lossless reciprocal 3 port matched network does not exist.
     (b) A matched four port lossless reciprocal network has the following S-parameters: S12=S21=S34=S43=0.5<π/2
         S13 and S24 are real and equal.
         If the incident power at port 1 is 20 mw and port 3 is terminated in shot circuit, calculate the power delivered to matched loads at port 2 and 4 and power reflected back from port1.

Q.4  (a) Explain working of a multicavity magnetron in π mode.
     (b) Explain with the help of apple gate diagram and necessary derivations, bunching process in a two cavity klystron.
Q.5  (a) Explain Faraday Rotation of e.m. field in a polarize ferrite medium.
(b) Obtain expression for resonant frequency of a rectangular resonator cavity in dominant mode.

Q.6  (a) Explain the properties and construction of PIN diodes giving its applications.
(b) Explain various modes of oscillations in gun diode.

Q.7  (a) Explain various methods of measurement of Microwave power.
(b) Explain how the frequency is measured at microwave range.

Q.8  Write short note on any two of the following:
(1) Multihole Directional Coupler
(2) Parametric Amplifiers
(3) VSWR Measurement.

EC-605
COMMUNICATION NETWORK & TRANSMISSION LINES
Duration: 3 hours                                                                                                 Max. Marks: 100
Note: All questions are compulsory. Each question contains internal choice. All questions carry equal marks.

UNIT-1
Que. 1:  (a) Discuss bridged T-network with suitable diagram.
(b) Design bridged T attenuator working into 600Ω to provide 20db attenuation.

OR
Que. 2:  (a) Explain step by step designing method for attenuators.
(b) Find the characteristic impedance of a symmetric T section whose total series arm impedance is (50+j125) Ω and shunt arm impedance is (200-j100) Ω.

UNIT-2
Que. 3 (a) Discuss constant –K low pass filter with suitable diagram. Derive expression for Cut- off frequency (fc).
(b) Write a note on: Chebysheve approximation.

OR
Que. 4 what are composite filters? Why are they used? Discuss composite filter in detail with suitable sketches. (b) Design m-derived T-section low pass filter having cut off frequency of fc=1 kHz Design impedance of Ro=600Ω and the frequency of infinite attenuation, f∞=1050Hz.

UNIT-3
Que. 5 (a) Explain foster and cauer network with suitable examples?
(b) Realize the functions using foster I and cauer I form respectively
(1) \( Z(s) = \frac{2(s+1)(s+3)}{s(s+2)} \) \hspace{1cm} (2) \( Z(s) = \frac{2s^2+8s+6}{s^2+2s} \)

**OR**

Que.6 (a) Find whether the given functions are positive real or not:

1. \( F(s) = \frac{(s+1)(s+2)}{s(s+3)} \)
2. \( F(s) = s^4+6s^2+9 \)

(b) Explain properties of positive real function?

**UNIT – 4**

Que.7 (a) A transmission line has a characteristics impedance of \((50 + j0.01) \Omega\) and is terminated in a load impedance of \((73 – j 42.5) \Omega\). Calculate

1. The reflection co-efficient.
2. The Standing Wave Ratio.

(b) Discuss the physical significance of voltage and current equation for the infinite line?

**OR**

Q.8 (a). Define and explain the insertion loss. How will you measure insertion loss by impedance and standing wave measurement method?

(b). A generator of 1 volt, 1 kHz supply power 1000 km long open wire line terminated in \(Z_o\) and having following parameters - \(R=10.4 \Omega/km\), \(L=0.0037 \text{ H/km}\), \(G=0.8 \mu\text{S/km}\), \(C= 0.00835 \mu\text{F/km}\). Calculate the Phase velocity, characteristic impedance, propagation constant, Power delivered to the load?

**UNIT-5**

Q.9 What is smith chart? How this chart is made use of in solving transmission line problem.

**OR**

Q.10 Write short note on application of \(\lambda/8\), \(\lambda/4\) and \(\lambda/2\) lines.
EC-605
COMMUNICATION NETWORK & TRANSMISSION LINES

Duration: 3 hours                                                                                       Max. Marks: 100
Note: All questions are compulsory. Each question contains internal choice. All
questions carry equal marks.

UNIT-1
Q.1 (a) Find image and Iterative impedances of a T-network of series and shunt
arm impedances $Z_1$ and $Z_2$ (series) and $Z_3$ (shunt) are $Z_1 = 30 + j7.5$ ohms, $Z_2 = 50 + j10$ ohms, $Z_3 = -j3229$ ohms.
(b) Explain terms Image Impedance and characteristic Impedance.

OR
(a) Design $∏$-type attenuating network to match between 400 ohms and 800
ohms to give attenuation of 15db.
(b) Discuss Lattice network with suitable diagram.

UNIT-2
Q.2 (a) Design M-derived High pass filter $∏$- section to work into load of 600
ohms with cut off frequency of $(1000/∏)$Hz and peak attenuation frequency
at 300Hz.
(b) Write a short note on: Elliptic function approximation

OR
(a) Differentiate between constant-K and M-derived filter. Also explain M-
derived low pass filter.
(b) Compare the following (i) active and passive filter (ii) Band pass and
band elimination filters

UNIT-3
Q.3 (a) What is reactance network? What is Foster I and Foster II from of
network?

(b) Write a short note on: Brunes method of realization?

OR
(a) Write a short note on: Bott-duffin method of realization.
(b) The driving point impedances function of a one port network is given by
$$Z(s) = \frac{5s}{(s^2 + 2.25)(s^2 + 9)(s^2 + 1)(s^2 + 4)(s^2 + 16)}$$
Obtain the foster I form.

UNIT-4
Q.4 (a) Write a short note on: Equalizers.
(b) A transmission line has characteristic impedances of 500 ohms. It has been
terminated in a 200 ohms load. If the load is dissipating a continues sinusoidal power of 100watts, calculate reflection coefficient and VSWR on
the line.

OR
(a) Define terms reflection loss and drive the expression for reflection factor.
(b) Discuss about frequency and phase wave form distortion. How they can be reduced?

UNIT-5
Q.5  (a) Discuss single stub impedance matching on the lines.
(b) A co-axial cable is made of copper having conductivity of $5.75 \times 10^7$ $\text{v/m}$. The inner conductor radius of 8 mm and has a thickness of 1 mm. The space between conductors is filled with a dielectric material of relative permittivity of 4. Calculate per km the following. Inductance L, capacitance C, DC resistance?

OR
(a) Explain method of measurement of power and SWR of a transmission lines.
(b) What is smith chart? How this chart is made use of in solving transmission lines problems?