USN | | | | | | | | | |

14ECS21

Second Semester M.Tech. Degree Examination, June/July 2015
Wireless Communication

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1 a. Define fading. Also describe the variations with its types. Indicate the key parameters in its discrete time base band model for the physical parameters of the channel. **(10 Marks)**

b. Discuss how to obtain time channel model from continuous time channel model. Draw and explain the system diagram from the base band transmitted symbol x[m] to the base band sampled received signal y[m]. **(10 Marks)**

2 a. Derive the detection problem in a Rayleigh fading channel with respect to non-coherent. Assume a flat fading model with filter taps. **(10 Marks)**

b. With a neat block diagram explain basic elements of a direct sequence spread spectrum (DSSS) systems. **(10 Marks)**

3 a. Explain the OFDM transmission and reception schemes, with relevant expressions for the cyclic prefix operations. **(10 Marks)**

b. Explain Alamouti schemes used in transmit diversity with relevant equations. **(10 Marks)**

4 a. Write short notes on: i) Angle diversity ii) Frequency diversity. **(10 Marks)**

b. With a neat figure explain BER driven selection diversity. **(10 Marks)**

5 a. With relevant expressions, explain continuous time AWGN channels. **(10 Marks)**

b. Explain outage performance of parallel channels. **(10 Marks)**

6 a. Discuss space diversity and systems based on space diversity. **(10 Marks)**

b. Explain how MIMO differs from smart antenna. **(10 Marks)**

7 a. Explain how to incorporate space time coding in MIMO. **(10 Marks)**

b. List the advantages and applications of MIMO in present context and also MIMO applications in 3G. **(10 Marks)**

8 a. What are smart antennas? What are the purpose of using smart antennas? **(10 Marks)**

b. With a neat block diagram, explain spatial multiplexing. **(10 Marks)**

* * * * *

USN | | | | | | | | | | |

14ECS22

Second Semester M.Tech. Degree Examination, June/July 2015
RF and Microwave Circuit Design

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions.***
2. ***use of Smith Charts Permitted***

1 a. Mention the reasons for using RF/Microwaves and briefly discuss all RF/microwave applications. **(10 Marks)**

b. Explain the working of inductor and capacitor at low frequency and high frequency and Design a resonant circuit with a loaded Q = 1.1 at f = 142.4MHz that operates between source resistance of 100Ω and load resistance of 100Ω. **(10 Marks)**

2 a. Discuss all the properties of waves. **(04 Marks)**

b. What is the goal of impedance matching and what are different designing methods used for matched circuit for lumped elements and briefly explain the same. **(06 Marks)**

c. Design matching networks that will match a source resistance of 50Ω to a capacitive load at f_o = 75MHz for the figure given below the matching circuit should block the DC to the output using resonance method design matching circuit. **(10 Marks)**

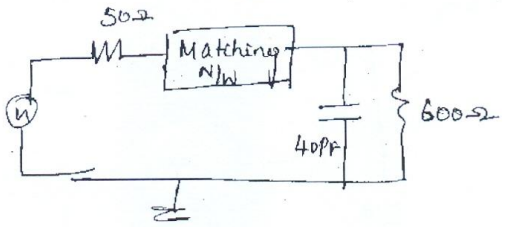

Fig. Q2 (c)

3 a. Discuss all the properties of 'S' parameters and obtain 'S' parameter in terms of Z = Parameter for the circuit below. **(10 Marks)**

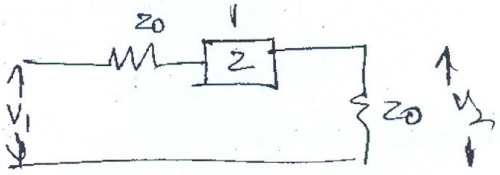

Fig. Q3 (a)

b. Consider a 50Ω loseless transmission line of length ℓ = 1m connected to a generator operating at f = 1GHz and having V_g = 10V with Z_g = 50Ω at one end and connected to load Z_L = 100Ω at the other determine

i) The Voltage and current at any point on the transmission line.
ii) The voltage at the generator Vi and load V_L ends.
iii) The reflection coefficient and VSWR at any point on the line.
iv) The average power delivered to the load **(10 Marks)**

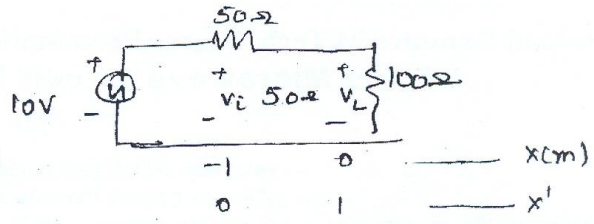

Fig. Q3 (b)

4 a. Determine the standing wave pattern on a transmission line ($Z_o = 50\Omega$) terminated in $Z_L = 100+j100\Omega$ with an incident voltage of $V^1 = 1\angle 0^0$ **(10 Marks)**

b. Define stub and what are different types of stub connection. Consider a transmission line $Z_0 = 50\Omega$ terminated in a load $Z_L = 15+j10\Omega$ as shown in the figure below. Calculate the I/P impedance of the line where the shunt open stub is located at d = 0.044 λ from the load and has length $\ell = 0.147\lambda$ **(10 Marks)**

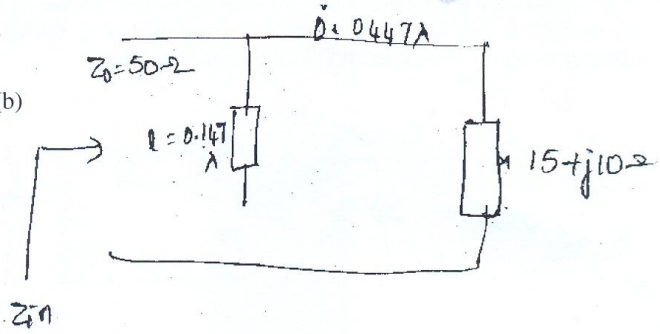

Fig. Q4 (b)

5 a. Define stability in active network and Find the signal flow graph of a two port N/w shown below

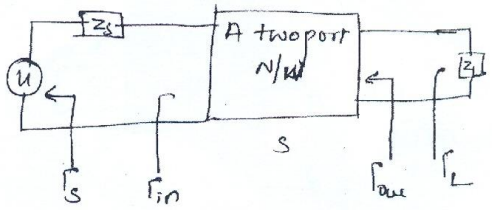

Fig. Q5 (a)

And derive expression for Γ_{in} and Γ_{out} using signal flow graph. **(12 Marks)**

b. Determine the stability of a GaAs FET that has the following S-parameter at 2GHz in a 50Ω system both graphically and mathematically **(08 Marks)**

$$S_{11} = 0.89\angle -60^\circ$$
$$S_{21} = 3.1\angle 123^\circ$$
$$S_{12} = 0.02\angle 62^\circ$$
$$S_{22} = 0.78\angle -27^\circ$$

6 a. Show that $F = F_1 + \frac{F_2 - 1}{GA_1}$ for cascade two stage networks. **(10 Marks)**

b. Define electrical noise and Mention Several types of noise. **(04 Marks)**

c. Calculate the noise power (indbm) and rms voltage at T = 290° K for R_N = 1 Ω, B = 1Hz **(06 Marks)**

7 a. Define mixer. Explain mixer with neat block diagram. **(10 Marks)**

b. Explain one diode (or single ended) mixer. **(05 Marks)**

c. Explain down converter mixer, up converter mixer and Harmonic Mixer. **(05 Marks)**

8 a. Define of phase shifter. What are two methods of designing of digital phase shifter. **(05 Marks)**

b. With a neat diagram describe the working of a switched line phase shifter. **(08 Marks)**

c. Compare Monolithic MIC and Hybrid MIC. **(07 Marks)**

* * * * *

USN | | | | | | | | | | |

14ECS23

Second Semester M.Tech Degree Examination, June/July 2015
Modern DSP

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Determine whether the following signals are periodic. If periodic, determine the fundamental period :

i) $x(t) = \cos t + \sin\sqrt{2}\, t$ ii) $x(n) = \cos\left(n\pi/3\right) + \sin\left(n\pi/4\right)$. **(06 Marks)**

b. Explain the concept of frequency in continuous time signals. **(06 Marks)**

c. Consider the analog signal $x_a(t) = 3 \cos 100\,\pi\, t$.

i) Determine the minimum sampling rate required to avoid aliasing.

ii) Suppose that the signal is sampled at the rate Fs = 200Hz, what is the discrete time signal obtained after sampling?

iii) Suppose that the signal is sampled at the rate Fs = 75Hz, what is the discrete time signal obtained after sampling?

iv) What is the frequency $0 < F < Fs/2$ of a sinusoid that yields samples identical to those obtained in part (iii). **(08 Marks)**

2 a. Let x(n) be a finite length sequence with $x(k) = \{0, 1 + j, 1, 1 - j\}$. Using the properties of DFT. Find DFTs of the following sequences :

i) $x_1(n) = e^{j\pi/2^n}\, x(n)$ ii) $x_2(n) = \cos\left(\pi/2^n\right) x(n)$ iii) $x_3(n) = x((n-1))4$

iv) $x_4(n) = (0, 0, 1, 0)$ ④ x(n). **(10 Marks)**

b. A complex sequence Z(n) with DFT Z(k) is formed as $Z(n) = x(n) + jy(n)$, where x(n) and y(n) are real sequences with corresponding DFTs X(k) and Y(k) respectively.

i) Express X(k) and Y(k) in terms of Z(k).

ii) Given $Z(k) = \{12 + j12\ ,\ 1.414 + j3.414,\ 0\ ,\ -0.5858 + j1.414\ ,\ -1.414 + j0.5858,\ 0\ ,\ -3.414 - j1.414\}$. Compute X(k) and Y(k) using the above relation. **(10 Marks)**

3 a. By means of DFT and IDFT, determine the response of the FIR filter with impulse response $h(n) = \{1, 2\}$ to the input sequence $x(n) = \{1, 2, 3\}$. **(08 Marks)**

b. Using overlap save method, compute y(n) of a FIR filter with impulse response $h(n) = \{3, 2, 1,\}$ and input.
$X(n) = \{2, 1, -1, -2, -3, 5, 6, -1, 2, 0, 2, 1\}$. Use only 8 – pt circular convolution in your approach. **(08 Marks)**

c. Derive the expression for Energy in terms of the frequency components $\{X(k)\}$ for a finite duration sequence x(n). **(04 Marks)**

4 a. A filter is to be designed with the following desired frequency response

$$H_d(w) = \begin{cases} 0; & -\pi/4 \le w_c \le \pi/4 \\ e^{-j2w}; & \pi/4 < |w_c| \pi \end{cases}$$. Find the frequency response of the FIR filter designed using a rectangular window defined below

$$W_R(n) = \begin{cases} 1; & 0 \le n \le 4 \\ 0; & \text{otherwise} \end{cases}$$. **(10 Marks)**

b. A LPF has the desired frequency response

$H_d(w) = H_d(e^{jw}) = \begin{cases} e^{-j3w}; & 0 \le w < \pi/2 \\ 0; & \pi/2 < w < \pi \end{cases}$. Determine h(n) based on frequency sampling technique. Take N = 7. **(10 Marks)**

5 a. Design a digital low pass Chebyshev Type – 1 filter to meet the following specifications.
$0.707 \le |H(e^{jw})| \le 1 \; ; \; 0 \le w \le 0.2\pi$ rads
$|H(ejw)| \le 0.1 \; ; \; 0.5\pi \le w \le \pi$ rads. Use Bilinear transformation. **(10 Marks)**

b. Derive the S to Z plane transformation based on finite backward difference method. Also show that the entire left half of S – plane is mapped inside the smaller circle of radius ½ at Z = ½ inside the unit circle in the Z – plane. **(06 Marks)**

c. For the given specifications, K_p = 3dB , K_s = 16 dB , f_p = 1 KHz and f_s = 2KHz. Show that the order of the Butter worth analog filter is more than the Chebyshev Type – I filter. **(04 Marks)**

6 a. Explain the sampling rate conversion by a factor D. **(06 Marks)**

b. Consider an arbitrary digital filter transfer function

$H(Z) = \sum_{n=-\infty}^{\infty} h(n)\, Z^{-n}$. Perform a two component polyphase decomposition of H(Z). Thus show that H(Z) can be expressed as $H(Z) = H_0(Z^2) + Z^{-1} H_1(Z^2)$. **(04 Marks)**

c. Obtain the direct form realization of sampling rate conversion by a factor I/D. Mention advantages and disadvantages of it. **(10 Marks)**

7 a. The estimate of the desired signal at the output of an adaptive noise canceller as shown in fig. Q7(a) is given by $\hat{S}_k = Y_k - \hat{n}_k = S_k + n_k - \hat{n}_k$. Show that minimizing the total power at the output of the cancellor maximizes the output SNR ratio. **(08 Marks)**

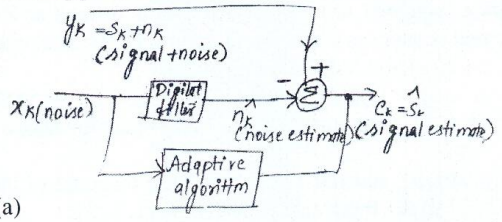

Fig.Q7(a)

b. Write a note on Trans multiplexer. **(12 Marks)**

8 a. Explain Linear predictive coding of speed signals. **(10 Marks)**

b. Explain the RLS algorithm and mention their properties and advantages over LMS algorithm. **(10 Marks)**

*****

USN | | | | | | | | | | |

14ECS24

Second Semester M.Tech Degree Examination, June/July 2015
Optical Communication and Networking

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Discuss the wave approach for the propagation of light through the fiber. **(10 Marks)**
b. Explain the operation of laser, with neat diagram. **(08 Marks)**
c. What are graded index fibers? **(02 Marks)**

2 a. Explain the function and principle of operation of the following :
i) Gratings ii) Mach – Zehender Interferometer. **(12 Marks)**
b. What are the key characteristics of optical filtering systems? **(05 Marks)**
c. What is a directional coupler? Mention its applications. **(03 Marks)**

3 a. With neat block diagram, explain blocks involved in receiver. List the various noise in each block and explain. **(12 Marks)**
b. Estimate the error rate of an ideal receiver. **(04 Marks)**
c. Write a note on coherent detection. **(04 Marks)**

4 a. Discuss power penalty in transmission system engineering. **(08 Marks)**
b. Explain gain equalization in EDFAs. **(05 Marks)**
c. Discuss chromatic dispersion limits in NRZ modulation scheme. **(07 Marks)**

5 a. Write a note on : i) ESCON ii) HIPPI. **(06 Marks)**
b. Explain in brief adaptation layers in ATM. **(04 Marks)**
c. Briefly explain layer and multiplexing scheme in SONET. **(10 Marks)**

6 a. Discuss in brief wavelength conversion. **(08 Marks)**
b. Explain with neat diagrams, OADM architectures. What is the necessity of reconfigurable OADM? **(12 Marks)**

7 a. Discuss various network management functions. **(10 Marks)**
b. With neat diagrams, explain how connection management protocols interact with client layers of the optical layer. **(10 Marks)**

8 Write short notes on the following :
a. Alarm Management.
b. QOS in ATM network standard.
c. Subcarrier modulation.
d. Erbium doped filter amplifier. **(20 Marks)**

*****

USN | | | | | | | | | | |

14ECS253

Second Semester M.Tech. Degree Examination, June/July 2015
Advanced Embedded Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. What is memory shadowing? What is its advantage? **(04 Marks)**
b. Explain the sequence of operation for communicating with a 1-wire slave device. **(08 Marks)**
c. Explain Harvard Architecture and von-Neumann Architecture. **(08 Marks)**

2 a. Explain the product life cycle curve of an embedded product development. Calculate the availability of he product if its meantime between failure is 4 months and the meantime to Repair is 2 weeks. **(10 Marks)**
b. Explain the different characteristics of an embedded system. **(10 Marks)**

3 a. What is state and state machine? Explain FSM for Automatic Tea/Coffee vending machine. **(10 Marks)**
b. Explain use case diagram and sequence diagram of UML with an example. **(10 Marks)**

4 a. What is Inline Assembly? Give examples for situations demanding mixing of 'C' with assembly language. **(10 Marks)**
b. What is modular programming? When it is employed? Explain Assembly language to machine language conversion process. **(10 Marks)**

5 a. Explain the handling of priority Inversion problem with priority Ceiling. **(10 Marks)**
b. Three processes with process ID's P_1, P_2, P_3 with estimated completion time 10, 5, 7 milliseconds respectively enters the ready queue together. A new process P_4 with estimated completion time 2 milliseconds enters the ready queue after 2 milli seconds of execution of P_2. Calculate waiting time, Turn around time for each process and average waiting time and average turn around time SJF algorithm. Assume all the processes contain only CPU operation and no I/O operations are involved. **(10 Marks)**

6 a. Explain the different functional and non-functional requirements that needs to be evaluated in the selection of RTOS. **(10 Marks)**
b. Explain the concept of memory mapped object for Inter process communication. **(10 Marks)**

7 a. Explain monitor program based firmware debugging and In circuit Emulated based firmware debugging in detail. **(10 Marks)**
b. Explain the various elements of an embedded system development environment. **(10 Marks)**

8 Write brief notes on
a) Open moko
b) Java for embedded development
c) Embedded OS trends
d) Chip level multiprocessor. **(20 Marks)**

* * * * *