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14ECS21

Second Semester M.Tech. Degree Examination, June /July 2016
Wireless Communication

Time: 3 hrs. Max. Marks:100

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

1 a. Define the following :
   i) Large scale fading
   ii) Small scale fading. **(04 Marks)**
   b. Explain physical modeling for wireless channels. **(06 Marks)**
   c. Describe the free space electric field for moving antenna and fixed receive antennas. **(10 Marks)**

2 a. Explain the following :
   i) Baseband equivalent model
   ii) Discrete time baseband model. **(12 Marks)**
   b. List the physical parameters of channel and their representative values. Explain types of wireless channels. **(08 Marks)**

3 a. Define diversity. Give the classification of diversity. **(06 Marks)**
   b. Explain receive, transmit and transmit and receive diversity in antenna diversity. **(06 Marks)**
   c. In frequency diversity explain the concept of direct - sequence spread – spectrum. **(08 Marks)**

4 a. Explain the following :
   i) Transmit diversity
   ii) Detection in Raylength fading channels only non coherent detection. **(12 Marks)**
   b. Explain the concept of repetition coding and packing spheres in AWGN channel capacity. **(08 Marks)**

5 a. Explain resources of the AWGN channel. **(06 Marks)**
   b. Explain the following with reference to linear time-invariant Gaussian channels :
   i) Single input multiple output channel
   ii) Multiple input single output channel
   iii) Frequency selective channel. **(14 Marks)**

6 a. Explain the following of capacity of fading channels :
   i) Slow fading channel
   ii) Fast fading channel. **(12 Marks)**
   b. Explain multiplexing capability of deterministic MIMO channels. **(08 Marks)**

7 a. Describe in detail physical modeling of MIMO channels. **(08 Marks)**
   b. Explain the modeling of MIMO fading channels. **(08 Marks)**
   c. Explain degrees of freedom and diversity. **(04 Marks)**

8 Write a short note on the following :
   a. Angular domain representation of signals
   b. MIMO application in 3G
   c. Smart antennas
   d. Geographically separated antennas. **(20 Marks)**

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14ECS22

Second Semester M.Tech. Degree Examination, June/July 2016
RF & Microwave Circuit Design

Time: 3 hrs. Max. Marks:100

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

1 a. Brief on low and high RF circuit design considerations. **(06 Marks)**

b. Consider the circuit shown below:

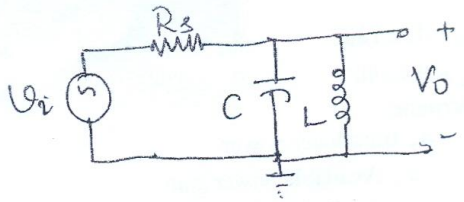

Fig. Q1 (b)

If the shunt arm impedance of the above circuit consists of a perfect capacitor in parallel with a perfect inductor, compute and plot the voltage gain magnitude and phase. **(06 Marks)**

c. Design a resonant circuit with a loaded Q of 50 which operates between a source resistance of 100 Ω and a load resistance of 2000 Ω at a frequency of 100 MHz. **(08 Marks)**

2 a. Using a tapped-C method, design a resonant circuit with a loaded Q of 40 at a centre frequency of 100 MHz that operates between a source resistance of 100 Ω and a load resistance of 3000 Ω. All capacitors are loss-less and the inductor has a Q of 100 at 100 MHz. **(08 Marks)**

b. Highlight on the impedence transformers that may be used to increase the value of source and load resistance such that the quality factor is maintained high. **(04 Marks)**

c. Design a simple parallel LC resonant circuit to provide a bandwidth of 10 MHz at a centre frequency of 100 MHz. The resonant circuit operates between a source and a load impedence 2 KΩ each. The capacitor is loss less and the Q of the inductor is 85. Calculate the insertion loss of the resonant circuit in operation. **(08 Marks)**

3 a. Explain attenuation constant due to the propogation of sinusoidal signal on a transmission line. **(10 Marks)**

b. Consider a two port network such as a micro wave amplifier. Deduce the signal flow graph for the same. **(10 Marks)**

4 a. Determine the standing wave pattern on a transmission line with $Z_0 = 50\Omega$ and $Z_L = 100 + j100\Omega$. The incident voltage is $V^+ = 1\angle 0^0$. Using Smith chart locate $(Z_L)_N$ $(Z_{min})_N$ and $(Z_{max})_N$ and thus compute VSWR. **(10 Marks)**

b. Design a matching network to transform a load impedance of $Z_L = 50 + j50\Omega$ to the input impedance $Z_{IN} = 25 - j25\Omega$ for the following two cases:

i) Lumped element design
ii) Distributed element design. **(10 Marks)**

5 a. Relate the input and output VSWR to mismatch factor at the source and load of a two port network. **(08 Marks)**

b. Consider a transistor amplifier as a two port network shown below:

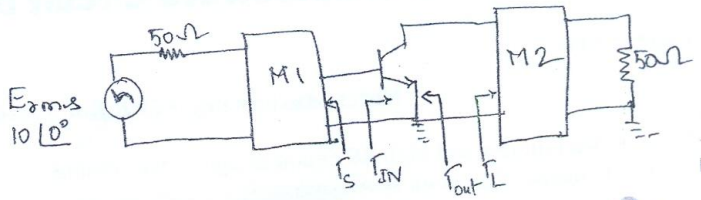

Fig. Q5 (b)

$\Gamma_S = 0.5\angle 120^\circ$ $S_{11} = 0.6\angle -160^\circ$ $S_{21} = 2.5\angle 30^\circ$

$\Gamma_L = 0.4\angle 90^\circ$ $S_{12} = 0.045\angle 16^\circ$ $S_{22} = 0.5\angle -90^\circ$

Determine:

(i) σ_T transducer power

σ_A Available power gain

σ_p Operating power gain.

(ii) The power levels P_L, P_{IN}, P_{AVS} and P_{AVN}.

(iii) The mismatch loss in (dB) at the input and output of the transistor.

(iv) $(VSWR)_{IN}$ and $(VSWR)_{OUT}$. **(12 Marks)**

6 a. Consider a cascaded two stage amplifier. Derive the noise figure of the system. **(10 Marks)**

b. An antenna is connected to an amplifier through a transmission line having an attenuation of 3 dB. The amplifier parameters are as specified below.

$G_A = 20$ dB, $B = 200$ MHz, $T_e = 145$K.

Calculate the overall noise figure and gain of the system at 300 K. **(10 Marks)**

7 a. Discuss on the design of small signal amplifiers. **(08 Marks)**

b. Explain about the types of coupling devices used for binary structure. **(12 Marks)**

8 a. Brief about conversion loss for SSB mixers. **(05 Marks)**

b. Consider a single ended mixer having the following port VSWR values at 10 GHz.

$(VSWR)_{RF} = 2.0$, $(VSWR)_{IF} = 3.0$, $L_h = 3$ dB.

The diode used in the mixer has $R_j = 100\ \Omega$, $R_S = 2\ \Omega$ and $C_j = 0.2$pF.

Compute conversion loss of the mixer. **(10 Marks)**

c. Explain in brief about Microwave Monolithic Integrated Circuits (MMICs). **(05 Marks)**

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14ECS23

Second Semester M.Tech. Degree Examination, June/July 2016
Modern DSP

Time: 3 hrs. Max. Marks:100

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

1 a. What are the advantages of digital over analog signal processing? **(04 Marks)**

b. Check whether the following signals are periodic if periodic, find the periodicity
i) $x(n) = 3\cos(5n+\pi/6)$ ii) $x(n) = \cos(n/8)\cos(\pi n/8)$ **(06 Marks)**

c. Why is quantization necessary in digital signal processing? Derive the expression for signal to Noise ratio of sinusoidal quantization. **(06 Marks)**

d. An analog signal $x_a(t) = \sin(480\pi t)+3\sin(720\pi t)$ is sampled 600 times per second.
i) Determine the Nyquist sampling rate for $x_a(t)$
ii) Determine the folding frequency
iii) What are the frequencies in radians, in the resulting discrete time signal x(n)?
iv) If x(n) is passed through on ideal DAC, what is the reconstructed signal $y_a(t)$? **(04 Marks)**

2 a. Explain the concept of sampling the spectrum of the discrete time a periodic signal and discuss discrete Fourier transform with neat plot. **(06 Marks)**

b. For the sequences $x_1(n) = \cos\left(\frac{2\pi}{N}n\right)$

$$x_2(n) = \sin\left(\frac{2\pi}{N}n\right),\ 0 \le n \le N-1$$ **(10 Marks)**

Determine the N-point:
i) Circular convolution $x_1+(n) \Theta x_2(n)$
ii) Circular correlation of $x_1(n)$ and $x_2(n)$
iii) Circular auto correlation of $x_1(n)$
iv) Circular auto correlation of $x_2(n)$

c. Compute the 4 – point DFT of the sequence $x(n) = \{2, 1, 2, 1\}$. **(04 Marks)**

3 a. Consider a FIR system with impulse response $h(n) = \{1, 2\}$. If the input $x(n) = \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\}$ is applied to the system, find the output y(n) of the system using overlop save method. **(08 Marks)**

b. Explain in detail the application of DFT for linear filtering. **(06 Marks)**

c. Determine the response of the FIR filter with impulse response $h(n) = \{1,2\}$ when the input sequence $x(n) = \{1, 2, 3\}$ is applied. **(06 Marks)**

4 a. Explain any four types of windows used for FIR filter design, with relevant time function, magnitude response and mathematical equation. **(10 Marks)**

b. A low pass filter has the desired frequency response given by

$$H_d(e^{jw}) = \begin{cases} e^{-j3w}, & o < w < \pi/2 \\ 0, & \pi/2 < w < \pi \end{cases}$$

Determine h(n) based on frequency sampling technique with N = 7. Also obtain the frequency response. **(10 Marks)**

5 a. Explain the analog to analog frequency transformation with relevant magnitude response, forward transformation and backward design equation. **(06 Marks)**

b. Starting from the magnitude squared frequency response of the Butterworth filter, discuss the filter design steps including calculation of roots of the denominator polynomial, derivation of expression for order of the filter, cut-off frequency and obtaining transfer function. **(10 Marks)**

c. Discuss the steps involved in IIR filter design by Bilinear transformation. **(04 Marks)**

6 a. The specifications of the desired IIR law pass filter are

$0.8 \leq |H(w)| \leq 1.0; 0 \leq w \leq 0.2\pi$

$|H(w)| \leq 0.2; 0.32\pi \leq w \leq \pi.$

Design Butterworth digital filter using impulse invariant transformation. **(10 Marks)**

b. Explain mapping of s-plane to z-plane in impulse invariant transformation and relation between analog and digital frequency. **(05 Marks)**

c. Describe the process of decimation by a factor D, with relevant graphical representation and mathematical analysis. **(05 Marks)**

7 a. Explain the sampling rate conversion by rational factor I/D, with neat block diagram and mathematical analysis. **(10 Marks)**

b. What are the applications of mulitrate signal processing? Explain. **(10 Marks)**

8 a. Explain adaptive direct form FIR filters. **(07 Marks)**

b. What is least mean square algorithm? Explain its significance. **(07 Marks)**

c. Write short notes on RLS algorithm. **(06 Marks)**

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14ECS24

Second Semester M.Tech. Degree Examination, June/July 2016
Optical Communication and Networking

Time: 3 hrs. Max. Marks:100

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

1 a. Explain in detail the non linear effects related to the propagation of light in optical fiber communication system. **(14 Marks)**

b. Find the acceptance angle and bit rate distance product for a fiber having RI of core is 1.5 and core cladding difference is 0.01? **(06 Marks)**

2 a. Classify optical fibers with respect to
i) RI profile ii) Propagation of light iii) Sources
iv) Receivers, Amp and fiber attenuation and list its application. **(10 Marks)**

b. What is chromatic dispersion in optical fiber? How it can be controlled? **(10 Marks)**

3 a. Construct and explain the principle operation of couplers, Isolators and Bragg's gratings. Also design an optical ADD/DROP elements based on FBG with the help couples and circulator only. **(10 Marks)**

b. Construct and explain the principle of operation of Fabry perot resonant cavity Lasers? Construct 2 dimensional array of vertical cavity surface emitter lasers? **(10 Marks)**

4 a. With neat sketch explain construction of modified duo binary signaling for the given data 101100011100. **(10 Marks)**

b. Explain the link power Budget calculations of an OFC system. List out the system consideration. Design a link loss budget analysis for a system graphically and compute maximum attenuation limit and transmission distance for a point to point link for a data rate 20 Mbps at 850nm, LO has odBm, App has – 56dBm sensitivity used, GIF which is having 3.5dB/km. Connector loss of 1dB/1km which 6dB system operating margin. **(10 Marks)**

5 a. With a neat band diagram, explain operation of EDFA? List various noises evolved during amplification process? How to correct it? **(10 Marks)**

b. Explain the characteristics of EDFA, Raman and SOA with block diagram and its applications. **(10 Marks)**

6 a. Explain SONET layers, structures, over head bytes and infrastructure elements? **(10 Marks)**

b. Explore the features of WDM networks and its architectural aspect of the network elements. **(10 Marks)**

7 a. Explain the key attributes to be looked for an OADM architectures. With neat sketches explain OADM architectures and what is reconfigurable OADM architectures. **(10 Marks)**

b. Explain RWA algorithms used to find alternate router. **(05 Marks)**

c. Explain the different types of light path topologies that can be deployed over a fiber ring topology. **(05 Marks)**

8 Write a note on :
a. Function of network management
b. Optical layer servicing and interfacing
c. Alaram management
d. BER measurement/optical trace. **(20 Marks)**

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14ECS253

Second Semester M.Tech. Degree Examination, June/July 2016
Advanced Embedded System

Time: 3 hrs. Max. Marks:100

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

1 a. Discuss the characteristic features of embedded system to contrast them with general purpose computing system. **(08 Marks)**

b. Write a note on the types and applications of programmable logic devices (PLDs) as embedded system cores. **(06 Marks)**

c. Explain the role of reset circuit in embedded system. **(06 Marks)**

2 a. Explain non operational quality attributes in embedded systems. **(10 Marks)**

b. Explain the role of Brown out protection circuit in embedded system. **(05 Marks)**

c. Discuss the sensors and activators in embedded system. **(05 Marks)**

3 a. What is hardware software co-design? Discuss fundamental issues in Hardware software co-design. **(10 Marks)**

b. Discuss state machine model in computational model in embedded design with neat figure. **(10 Marks)**

4 a. Explain Assembly Language based Development Technique. **(10 Marks)**

b. Discuss the super loop based approach in embedded firm ware design. **(10 Marks)**

5 a. Discuss in detail the process and threads in RTOS based embedded system design with neat sketch. **(14 Marks)**

b. What is a real time kernel? List its basic functionalities and explain any one. **(06 Marks)**

6 a. Discuss task scheduling in RTOS based embedded system design with neat figure. **(10 Marks)**

b. Discuss in detail Remote procedure call (RPC) and sockets in task communication with neat sketch. **(10 Marks)**

7 a. What is an IDE? Precisely explain the features of a typical IDE. **(06 Marks)**

b. Explain with example.

i) List file [.LST File]

ii) Object file [.Obj file]

iii) Map file [.Map file] **(12 Marks)**

c. Define Dissembler | De compilers. **(02 Marks)**

8 a. Explain any two processor trends in embedded industry. **(06 Marks)**

b. Discuss importance of Java for embedded Development. **(08 Marks)**

c. Explain Bottlenecks faced by the embedded industry. **(06 Marks)**

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