Subject: VLSI Design (Elective – I)

PART – A (25 Marks)

1. What is Latch-up in CMOS circuits?
2. What is X in VLSI design? It \( \lambda = 0.25 \mu m \) for a given technology, what is the minimum feature dimension.
3. Differentiate between simulation and synthesis.
4. What is transmission gate? Draw the circuit diagram and list the advantages of transmission gate over pass transistor.
5. What is switch logic?
6. Draw the circuit diagram of Wilson current mirror.
7. Draw the stick diagram of 1-bit shift register.
8. Briefly explain chemical vapor deposition process in fabrication of VLSI circuits.
9. Draw the circuit diagram of BICMOS inverter.
10. Classify the memories.

PART – B (50 Marks)

11. a) What is threshold voltage? Derive an expression for threshold voltage for a P-channel MOSFET.  
    b) Explain the characteristics of a MOS-capacitor.
12. a) What are the different pull-up structures used in CMOS based inverters? What are the relative advantages of each of these structures.  
    b) Explain the importance of aspect ratio in FETs.
13. a) Draw the layout of NOR gate.  
    b) What is multiplexer? Draw the stick diagram of 4 x 1 mux using nMOS switches.
14. a) What is doping? List the two methods of doping techniques and briefly explain about Ion-implantation with neat sketch.  
    b) Briefly explain oxidation process used in IC fabrication.
15. Elaborate the design considerations of ALU with neat sketch.
16. a) Explain the operation of various CMOS current mirrors with neat sketches.  
    b) List out the features of a basic op-amp.
17. Write short notes on following:  
    a) Emitter area in BJTs  
    b) Testing of VLSI circuits  
    c) Bipolar current mirrors

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FACULTY OF ENGINEERING
B.E. 4/4 (ECE) I – Semester (Old) Examination, July 2014

Subject: Optical Fiber Communication (Elective – I)

Time: 3 hours
Max. Marks: 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Mention different types of refractive index profile with neat sketches.
2. What are different types of bending losses in optical fiber?
3. What is the significance of numerical aperture?
4. What are the linear scattering losses in optical fiber?
5. Define optical and electrical bandwidth.
6. What are the semiconductor materials used for emission over the wavelength range 0.8 to 1.7 \( \mu \)m of the injection LASER?
7. What is the need for double hetero junction structure?
8. Mention different types of mechanical misalignments in fiber to fiber coupling.
9. What are different error sources in optical communication system?
10. What is the need for WDM.

PART – B (50 Marks)

11. a) What are merits and demerits of optical fibers?
    b) Differentiate between step index and graded index fiber.

12. What is meant by absorption losses in optical fibers, explain intrinsic and extrinsic absorption mechanisms?

13. Explain the principle and construction of APD with a neat sketch.

14. Define quantum efficiency and responsivity of photo diode with mathematical expressions. What is the relation between these two? State their significance.

15. Write a detailed notes of gain guided LASER diodes, and index guided LASER diodes with neat sketches.

16. Explain the principle of operation of a typical optical receivers with necessary mathematical expressions.

17. Write short notes on the following:
   a) Fusion splicing technique
   b) Analog optical receiver

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FACULTY OF ENGINEERING
B.E. 4/4 (ECE) I – Semester (New) (Supplementary) Examination, July 2014
Subject : Optical Fiber Communication (Elective – I)

Time : 3 hours
Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. What are the different fiber materials used in optical communication? 2
2. Compare between step-index and graded index fibers. 3
3. What are the advantages of optical fiber communication? 2
4. What are the different types of bending losses in optical fiber? 3
5. A gas laser operating at 850nm has a 500µm length and a refractive index n = 3.7. What are the frequency and wave length spacing? 3
6. Give the mechanical misalignment techniques that can occur between two joined fibers. 2
7. What are the different error sources in optical communication system? 3
8. Differentiate between FDM and WDM. 2
9. Write the advantages of LASER over LED. 2
10. What are the different error sources in optical communication system? 3

PART – B (50 Marks)

11. a) Write short notes on modes in cylindrical wave guide fiber. 5
    b) What are the merits and demerits of optical fibers? 5

12. Write detailed notes on linear and non linear scattering in optical fibers. 10

13. a) What is meant by absorption losses in optical fibers? Explain intrinsic and extrinsic absorption mechanisms. 5
    b) Explain the material dispersion in optical wave guide. 5

14. a) Explain the operation of DFB and DBR lasers. 5
    b) Explain the operation of APD. 5

15. Explain the construction and operation of surface emitting and edge-emitting LED’s with necessary diagrams. 10

16. a) List out different types of pre-amplifier and explain them. 5
    b) Derive expression for analog receiver sensitivity. 5

17. a) What is WDM, how it is different from FDM? 5
    b) What are the applications of WDM in LANs? 5

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Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Give details about image formation model. 2
2. Explain contrast stretching. 2
3. Define data redundancy and compression ratio. 3
4. Distinguish between image enhancement and image restoration. 3
5. What is Mach band effect? 2
6. What do you mean by point processing? 2
7. Define image subtraction. 2
8. What is additive noise and multiplicative noise? 3
9. What is meant by Inverse filtering? 3
10. Define cosine transform. 3

PART – B (50 Marks)

11. a) Draw the block diagram of a digital image processing system and explain each unit. 6
   b) Explain distance measures and different types of connectivity in pixel relationships. 4

12. State and prove the separability and periodicity properties of 2-D discrete Fourier transform. 10

13. a) Obtain the Haar Transform matrix for N = 4. 6
   b) List the properties of slant transform. 4

14. a) Discuss image smoothing filter with its model in the spatial domain. 5
    b) Discuss about derivative filters. 5

15. a) Draw the image degradation model and explain. 3
    b) Discuss about constrained least square restoration for a digital image in detail. 7

16. a) Explain how sub image size selection affect transform coding error. 5
    b) Explain Huffman coding with an example. 5

17. Write short notes on:
   a) Transform coding
   b) Bit plane slicing
   c) Frequency domain enhancement techniques

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FACULTY OF ENGINEERING

B.E. 4/4 (ECE) I – Semester (New) (Supplementary) Examination, July 2014

Subject : Digital Image Processing (Elective – I)

Time : 3 hours
Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. What is subjective brightness? Show its variation with respect to logarithm of intensity. 2
2. State the orthogonality property and rotation property of a 2D DFT. 2
3. Compute the 2D Haar transform of the signal \[ f(m,n) = \begin{bmatrix} 4 & -1 \\ 2 & 3 \end{bmatrix} \] 3
4. State the main difference between slant transform and Hadamard transform. 2
5. Write briefly about bit plane slicing. 3
6. What is histogram matching. What does the standard deviation of a histogram tell us about the image. 3
7. Draw the block diagram of image restoration. 2
8. What is Pseudo inverse filter? 2
9. Define a) Compression ratio b) Shannon noiseless coding theorem 3
10. Draw the block diagram and distinguish Lossy and Lossless predictive coding. 3

PART – B (50 Marks)

11. a) Define digital image. Explain the image formation model, and the concepts in sampling and quantization. 6
    b) Distinguish between photopic and scotopic vision. Explain about brightness adaptation and discrimination. 4

12. a) Define DCT. State its properties and advantages. 5
    b) List the classification of image transforms. Prove the convolution property of 2D DFT. 5

13. a) Describe histogram equalization. If the intensity values in an image have PDF \[ p(r) = \frac{2r}{(L-1)^2} \] for \( 0 \leq r \leq L - 1 \) and 0 otherwise, show that the result of applying the transformation produces a uniform PDF. 7
    b) State the steps involved in median filtering. 3

14. a) Derive the expression for Weiner filtering. How does a Weiner filter reduce to inverse filter. 6
    b) Explain spatial filtering technique. 4

......2
15 a) Illustrate the arithmetic coding process.

<table>
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<th>Source symbol</th>
<th>Probability</th>
<th>Initial Subinterval</th>
</tr>
</thead>
<tbody>
<tr>
<td>a1</td>
<td>0.2</td>
<td>(0.0, 0.2)</td>
</tr>
<tr>
<td>a2</td>
<td>0.2</td>
<td>(0.2, 0.4)</td>
</tr>
<tr>
<td>a3</td>
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<td>(0.4, 0.8)</td>
</tr>
<tr>
<td>a4</td>
<td>0.4</td>
<td>(0.8, 1.0)</td>
</tr>
</tbody>
</table>

b) Describe run length coding.

16 a) Define data redundancy. Describe the various redundancies for image compression.
b) State the algorithm for Huffman coding.

17 Write short notes on:
   a) Image Zooming Techniques
   b) Hotelling transform
   c) Point processing

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FACULTY OF ENGINEERING
B.E. 4/4 (ECE) I – Semester (Old) Examination, July 2014

Subject: Multi Signal Processing (Elective – I)

Time : 3 hours
Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Explain the linear phase response.
2. When do we need multistage implementation of sampling rate conversion.
3. Draw the characteristics of square root Nyquist filter.
4. Draw the realization diagram of a recursive all pass filter.
5. What are the advantages of multiple stage filter structure?
7. Write the differences between FIR and IIR filter designs.
8. Explain comb filter characteristics.
9. How do you find impulse response of a Half-band filter?
10. What is the need for anti-aliasing filter prior to down sampling?

PART – B (50 Marks)

11. a) Compare between the impulse invariant method and bilinear transformation method.
   b) Design a low pass FIR filter with Remez algorithm that meets the following specifications:
      Sampling rate : 100 KHz, minimum attenuation : 60 dB, pass band edge: ± 10 KHz.
      Pass band ripple : 0.1 dB, stop band edge : ± 15 KHz.

12. a) What is Gibbs phenomenon?
    b) Design a single pole low pass digital filter with a 3-dB bandwidth of 0.2π, using the
       Bilinear transformation applied for the analog filter.

      \[ H(s) = \frac{\Omega_c}{s + \Omega_c} \]

      Where \( \Omega_c \) is the 3-dB bandwidth of the analog filter.

13. a) Draw and explain the 2 channel poly phase form of the QMF bank.
    b) Prove the equivalence of 2 decimator configuration shown in below figure.
14 a) State and prove noble identities.  
    b) Explain about Forrow filters.  

15 a) Draw the poly phase diagram for a decimation 10.  
    b) Explain sampling rate conversion with a cascaded integrator comb filter.  

16 a) Explain the interpolated FIR filter with block diagram.  
    b) Discuss about M-path recursive all pass filter with diagram.  

17 Write short notes on any two:  
    a) Remez algorithm  
    b) Poly phase sub band coding  
    c) Arbitrary resampling ratio
1. What is multirate signal processing?

2. Define decimation and interpolation with an example.

3. What is the need for anti-aliasing filter prior to down sampling?

4. Explain about the design of linear phase Lth band FIR filters.

5. What is band pass interpolator?

6. What is meant by perfect reconstruction in poly phase representation?

7. Show that the two channel QMF bank in general, is a linear, time varying system with a period of 2.

8. Explain about wavelet transform.

9. What are the applications of multi rate processing?

10. What is Gibbs phenomenon?

PART – B (50 Marks)

1. a) Implement sampling rate conversion of FIR filter structure for decimator.

b) Write some applications of multi rate systems.

12. a) Explain about analysis and synthesis of uniform DFT filter banks with neat diagram.

b) Draw the characteristics of a Nyquist filter.

13. The structure of figure given has been proposed for the computationally efficient implementation of FIR digital filter.

a) Show that the structure is alias free and determine the overall transfer function

\[ T(Z) = \frac{Y(Z)}{X(Z)} \] in terms of \( H_0(Z) \) and \( H_1(Z) \).

b) Determine the expression for \( T(Z) \) if

\[ H_0(Z^2) = \frac{1}{2} \{ H(Z) + H(-Z) \} \]

\[ H_1(Z^2) = \frac{1}{2} \{ H(Z) - H(-Z) \} \]
14  a) Draw the equivalent representation of the 4-channel QMF structure.  
    b) Explain about Alias free IIR QMF bank.  

15  Explain briefly about multilevel filter bank with unequal pass bank width.  

16  a) Explain briefly about continuous wavelet transform.  
    b) Discuss the applications of multistage filter structure in communication system.  

17  Write a short notes on any two:  
    a) Cosine-modulation L-channel filter bank  
    b) Half band filter  
    c) Interpolation by an integer factor
FACULTY OF ENGINEERING
B.E. 4/4 (ECE) I – Semester (Old) Examination, July 2014

Subject: Embedded Systems (Elective – I)

Time: 3 hours
Max. Marks: 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Classify an Embedded system.
2. What is multitasking?
3. Enlist three architectural features to differentiate between PIC, Atmel and Philips controllers.
4. What is Inline assembly?
5. Draw the CAN frame format.
6. What is an ISR?
7. Describe a watchdog timer.
8. What is a linker?
9. List out the various inter-process communication methods in a real time system.
10. What is a cross assembler?

PART – B (50 Marks)

11. a) What are the design goals of embedded software?
    b) Draw a neat sketch of the hardware units of an embedded system.

12. a) Describe the features of a power PC.
    b) Classify the instruction set of ARM.

13. a) Explain the HDLC protocol.
    b) Differentiate between polling and interrupt.

14. a) What is a semaphore? How does it create a deadlock?
    b) Explain memory management.

15. a) Describe various co-design issues in the development process of an embedded system.
    b) What is an ICE? Explain.

16. a) Explain the PCI protocol.
    b) What are the advantages of using a simulator for debugging?

17. Write notes on any two:
    a) IDE
    b) Scheduling
    c) ROM Emulator

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FACULTY OF ENGINEERING
B.E. 4/4 (ECE) I – Semester (New) (Supplementary) Examination, July 2014
Subject : System Automation and Control (Elective – I)

Time : 3 hours
Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Define response time and setting time for transducers. 2
2. Draw the equivalent circuit of a pyroelectric sensor. 2
3. What are the criteria to choose suitable data acquisition equipment? 3
4. List out the significance of DAC. 3
5. What is the importance of mathematical models? 2
6. For the thermal building blocks write down the describing equations. 2
7. What do you mean by transient and steady state responses? 3
8. What is the overall transfer function of the negative feedback system with
   \[ G(s) = \frac{4}{s(s + 1)} \quad \text{and} \quad H(s) = \frac{1}{s} \] 3
9. List out the real world applications for motion control. 2
10. List out the instruction sets for microcontrollers. 3

PART – B (50 Marks)

11. a) Describe briefly liquid flow sensor. 5
    b) Explain working principle of light sensors. 5
12. a) Explain signal conditioning process. 5
    b) What do you mean by analog to digital conversion? Why it is necessary? List out the various methods available for analog to digital conversion. 5
13. Derive the relationship between input and output for hydraulic mechanical systems. 10
14. a) Explain the salient feature of a programmable communication interface. 4
    b) Describe PLC with the help of architecture. 6
15. What do you mean by closed loop controller? What are the different control modes are available? Explain any one in detail. 10
16. a) Draw the architecture of 8051 microcontroller and explain each block. 7
    b) List out and draw the ladder symbols used in PLC. 3
17. Write short notes on:
    a) Components of a motion control system 10
    b) Feedback devices

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Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Describe in brief, a data communication network.
2. What is flow control?
3. What is a multistage switch?
4. Enlist two differences between circuit switching and packet switching.
5. Differentiate between a LAN and a MAN.
6. Draw the MAC frame of 802.11 IEEE.
7. What is UDP?
9. What are the presentation layer services?
10. Draw a neat diagram of an ISDN based network.

PART – B (50 Marks)

11. Compare and contrast between the OSI and TCP/IP models, with respect to
   a) Layers and their functions
   b) Protocols
Which model is suitable for what kind of a setup? Justify.

12. a) Explain how a circuit switching is done on a network.
    b) What is routing? Describe different routing strategies.

13. a) Differentiate between CSMA/CD and token ring methods of accessing the medium.
    b) Compare 802.4 and 802.5 frames.

14. a) Describe the architecture of a simple bridge. What is its significance in a communication network?
    b) Differentiate between a connectionless and a connection oriented communication system.

15. a) Write an algorithm for generation of a key in communications.
    b) Differentiate between a frame relay and a cell relay.

16. a) What is an ARQ? Explain with an example.
    b) Write the token bucket method of congestion control.

17. Write notes on any two:
   a) IEEE 802.16
   b) ATM
   c) HDLC

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