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C028611(028)

B. Tech. (Sixth Semester) Examination, April-May 2022

AICTE (~~New~~ Scheme)

(Electronics & Telecommunication Branch)

VLSI DESIGN

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Part (a) of each question is compulsory and it carries 4 marks. Attempt any two part from (b), (c) and (d) of each question. Part (b), (c) and (d) carry 8 marks each.*

Unit-I

1. (a) What is Transmission gate? Draw the Exclusive-OR gate using Transmission gates.

(b) Draw the CMOS schematic of 2-i/p NAND & NOR Gate and explain their operation.

(c) Design a CMOS circuit for the OAI expression

$$h = \overline{(a+b)\cdot(a+c)\cdot(b+d)}$$

Use the smallest number of transistors in your design.

(d) An inverter uses FETs with $\beta_n = 2 \cdot 1\ \text{mA/V}^2$ and $\beta_p = 1 \cdot 8\ \text{mA/V}^2$. The threshold voltages are given as $V_{Tn} = 0 \cdot 60\ \text{V}$ and $V_{Tp} = -0 \cdot 70\ \text{V}$ and the power supply has a value of $V_{DD} = 5\ \text{V}$. The parasitic FET capacitance at the output node is estimated to be $C_{FET} = 74\ \text{fF}$.

(i) Find the midpoint voltage V_M.

(ii) Find the value of R_n and R_p

(iii) Calculate the rise and fall times at the output when $C_L = 0$.

(iv) Calculate the rise and fall times when an external load of value $C_L = 115\ \text{fF}$ is connected to the output.

Unit-II

2. (a) Define Lithography.

(b) Describe the various steps involved in fabrication process of CMOS using *n*-well process.

(c) Discuss Lamda-based design rules for layout designing in brief.

(d) Draw the stick diagram and Layout for two-input CMOS NAND gate. Align the transistors horizontally.

Unit-III

3. (a) Draw the schematic of RS Flip-Flop.

(b) Design CMOS Schematic of full adder circuit using minimum number of transistors.

(c) Explain the working of 4×4 NOR-ROM and 4×4 NAND-ROM with their schematic only.

(d) Draw the Schematic of 6-T DRAM and explain the working principle.

Unit-IV

4. (a) Give the comparisons between CPLD and FPGA.

(b) (i) Consider the function $f(x_1, x_2, x_3) = \Sigma m(2, 3, 4, 6, 7)$. Show how it can be realized

using two two-input LUTs. Give the truth table implemented in each LUT. You do not need to show the wires in the FPGA.

(ii) Write the VHDL codes for 8*1 Mux using With-Select statement.

(c) Write VHDL code for Full adder using Structural Modeling styles.

(d) Write the VHDL codes for 8-line to 3-line Encoder using CASE statement.

Unit-V

5. (a) What are the differences between signals and variables?

(b) What is FSM? Differentiate Mealy and Moore FSM.

(c) Write VHDL Code for T-Flip-Flop using Behavioral modeling styles.

(d) Write the VHDL codes for Synchronous BCD counter.

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C028612(028)

B. Tech. (Sixth Semester) Examination, April-May 2022

(AICTE ~~Branch~~) Scheme

ANTENNA & WAVE PROPAGATION

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) of each question is compulsory. Attempt any* ***two*** *parts from (b), (c) and (d). Part (a) is of 4 marks and part (b), (c) and (d) each are of 8 marks.*

Unit-I

1. (a) Define dominant mode in a waveguide. Write TE dominant modes in a parallel plane, rectangular and circular waveguides.

(b) Deduce the expression for cut-off frequency, guide wavelength, phase constant, group and phase velocity in case of a rectangular wave guide excited in TE mode.

(c) A hollow rectangular waveguide with dimensions 6 cm × 4 cm operates at 3 GHz. Find λ_c, λ_g, β_z and η for the TE_{10} mode.

(d) Write the advantages of circular waveguide over rectangular wave guide. An air filled circular waveguide is to be operated at a frequency of 6 GHz and is to have dimensions such athat $f_c = 0{\cdot}8\ f$ for TE_{11} mode. Determine diameter of the wave guide and guide wavelength.

Unit-II

2. (a) Write different modes of wave propagation and the frequency range in which they are suitable.

(b) Define radio horizon and calculate its value. Transmitting antenna is placed at a height of 166 meters. If the signal is to be received at a distance

of 66 km, what should be the height of the receiving antenna?

(c) Prove that the R.I. of layer of the atmosphere is given by :

$$\mu = \sqrt{1 - \frac{81N}{f^2}}$$

(d) Explain the following in relation to sky wave propagation :

(i) Skip distance

(ii) Critical frequency

(iii) Maximum usable frequency

(iv) Virtual height

(v) Optimum working frequency

Unit-III

3. (a) State Reciprocity theorem.

(b) What is a half wave dipole? Assuming a sinusoidal current distribution over the dipole length derive an

expression for the vector potential A at a large distance from the dipole and field values.

(c) Find out maximum effective aperture of short current element.

(d) For a given antenna $\phi = \phi_m \sin^2\theta \sin^3\phi$ where $0 \le \theta \le \pi$, $0 \le \phi \le \pi$. Find directivity D.

Unit-IV

4. (a) State the difference between broadside and end fired array.

(b) Derive the array factor of linear array consisting of n-isotropic radiators. Draw the radiation pattern of an array of 8 isotropic elements for broadside case, spacing between elements to be taken $\lambda/2$.

(c) Prove that the directivity for an end fire array of two identical isotropic in phase point sources spaced distance d apart is given by :

$$D = 2/\left[1 + (\sin 2\beta d / 2\beta d)\right]$$

(d) Design a five element broad-side array which has the optimum pattern for a side lobe level of (–20 dB). The spacing between elements has to be $\lambda/2$.

Unit-V

5. (a) What is antenna top loading and turning?

(b) Explain loop antenna as a direction finder. How sense of direction is determined in direction finding applications.

(c) Derive emf equation of loop antenna.

(d) What is Log-Periodic antenna? Mention important characteristics of this antenna.

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C028613(028)

B. Tech. (Sixth Semester) Examination, April-May 2022

(Scheme : AICTE)

(Electronics & Telecommunication Engineeing Branch)

DIGITAL SIGNAL PROCESSING

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) of each question is compulsory and carries 4 marks. Attempt* ***two*** *parts from part (b), (c) and (d) carrying 8 marks each.*

Unit-I

1. (a) Define DTFT and IDTFT of a sequence $x(n)$.

(b) Compute circular periodic convolutions of the two sequences

$x_1(n) = \{1, 1, 2, 2\}$ and $x_2(n) = \{1, 2, 3, 4\}$

(c) Given $x(n)=\{0, 1, 2, 3, 4, 5, 6, 7\}$, find $x(k)$ using DIT FFT algorithm.

(d) Given $x(n)=\{1, 2, 3, 4, 4, 3, 2, 1\}$, find $X(K)$ using DIF FFT algorithm.

Unit-II

2. (a) Describe finite impulse response.

(b) Relize the IIR filter

$$H(z)=\frac{2+8z^{-1}+6z^{-2}}{1+8z^{-1}+12z^{-2}}$$

using ladder structure.

(c) Obtain the cascade and parallel realization for the system function given by

$$H(z)=\frac{1+\frac{1}{4}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$$

(d) Obtain direct form and cascade form realization for the transfer function of an FIR system given by

$$H(z)=\left(1-\frac{1}{4}z^{-1}+\frac{3}{8}z^{-2}\right)\left(1-\frac{1}{8}z^{-1}-\frac{1}{2}z^{-2}\right)$$

Unit-III

3. (a) What do you understand by linear phase response?

(b) Express the process of windowing using illustration.

(c) A filter is to be designed with the following desired fequency response

$$H_d(e^{jw})=\begin{cases}0 & -\pi/4<w<\pi/4\\ e^{-2jw} & \pi/4\le|w|\le\pi\end{cases}$$

Determine the filter coefficient $H_d(n)$ if the window function is defined as

$$w(n)=\begin{cases}1 & 0\le n\le 4\\ 0 & \text{otherwise}\end{cases}$$

also, determine the frequency response $H(e^{jw})$ of the designed filter.

(d) Design a filter with

$$H_d(e^{jw})=\begin{cases}e^{-3jw}, & -\pi/4\le w\le\pi/4\\ 0, & \pi/4<|w|\le\pi\end{cases}$$

using Hamming window with M = 7.

Unit-IV

4. (a) Use the backward difference for the derivative to convert the analog low-pass filter with system function

$$H(s)=\frac{1}{s+2}$$

(b) Convert the analog filter into a digital filter whose system function is

$$H(s)=\frac{s+0\cdot 2}{(s+0\cdot 2)^2+9}$$

using impulse invariance technique. Assume $T=1$ sec.

(c) Design a Butterworth filter using the impulse invariance method for following specification

$$0\cdot 8\le\left|H\left(e^{jw}\right)\right|\le 1 \qquad 0\le w\le 0\cdot 2\pi$$

$$\left|H\left(e^{jw}\right)\right|\le 0\cdot 2 \quad 0\cdot 6\pi\le w\le\pi$$

(d) Design a digital Chebyshev filter to satisfy the constraints using Bilinear transformation and $T=1$ sec

$$0\cdot 707\le\left|H\left(e^{jw}\right)\right|\le 1 \qquad 0\le w\le 0\cdot 2\pi$$

$$\left|H\left(e^{jw}\right)\right|\le 0\cdot 1 \quad 0\cdot 5\pi\le w\le\pi$$

Unit-V

5. (a) What are the advantages of MDSP?

(b) Explain the process of decimation with example.

(c) Consider the figure below. The input to the system is given as

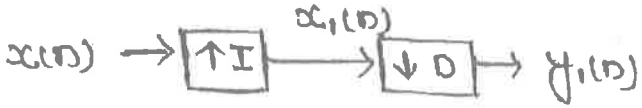


Fig (a)

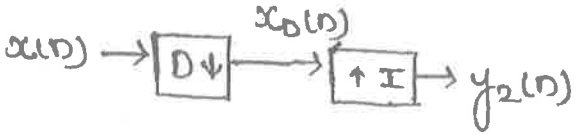


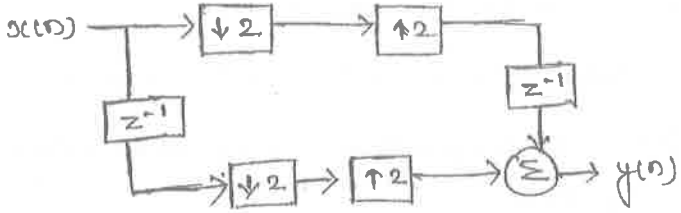
Fig (b)

$$x(n)=\{1, 3, 2, 5, -1, -2, 2, 3, 2, 1, \ldots\ldots\}$$

(i) If $D=4$ and $I=2$ show that outputs of the two configuration are different.

(ii) If $D=3$ and $I=2$ show that two system are identical

(d) A multirate system is shown in figure. Find the relation between $x(n)$ and $y(n)$.



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C028631(028)

B. Tech. (Sixth Semester) Examination, April-May 2022

(AICTE Scheme)

(Electronics & Telecommunication Engg. Branch)

INFORMATION THEORY and CODING

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Part (a) of each question is compulsory and carries 4 marks each. Attempt any two parts from (b), (c) and (d) of each question. Part (b), (c) and (d) carry 8 marks each.*

Unit-I

1. (a) How uncertainty is related to information? What is the unit of information?

(b) Consider a DMS with source probabilities (0·20, 0·20, 0·15, 0·15, 0·10, 0·10, 0·05, 0·05) :

(i) Determine an efficient fixed length code for the source.

(ii) Determine the Huffman code for this source

(iii) Compare the two Codes and Comment

(c) Encode the string using Lempel-Ziv algorithm and write the steps for the coding 101011011010101011.

(d) Explain in detail the lossless and lossy compression techniques.

Unit-II

2. (a) What are the different types of channel? Explain Binary Schematic Channel in detail.

(b) Explain Information Capacity Theorem in detail.

(c) Define Mutual Information and prove the following :

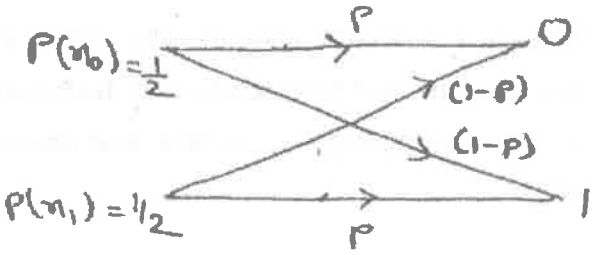
(i) $I(x;y) = I(y;x)$

(ii) $I(x;y) = H(x) - H\left(\frac{x}{y}\right)$

(iii) $I(x;y) = H(y) - H\left(\frac{y}{x}\right)$

(d) In the given figure of Binary Symmetric Channel find the rate of Information Transmission across this channel for $P = 0{\cdot}8$. The symbols are generated at the rate of 1000 per second $P(X_0) = P(X_1) = \frac{1}{2}$.

Also determine channel input information rate.



Unit-III

3. (a) Define Linear Codes. What are the different properties of linear codes?

(b) Design the encoder for (7, 3) cyclic code generated by $h(p) = (p^3 + p + 1)$ and verify its operation by

any message vector.

(c) A (6, 3) code is generated according to the generator matrix. The receiver receives $Y = 100011$. Determine the corresponding data word if the channel is a binary symmetric channel and maximum likelihood decision is used :

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

(d) Write the features of Hamming Codes. Determine if the code generated from the generator matrix of (6, 3) code is Hamming code or Not. Find encoding table.

$$G = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

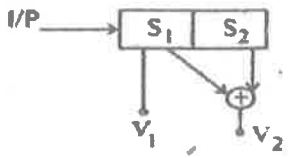
Unit-IV

4. (a) How convolution codes are differ from block Codes?

(b) Write the algorithm for Viterbi Decoding and explain it with the help of Trellis diagram.

(c) Obtain the codeword for the convolutional encoder (2, 1, 2) using Transform domain approach. The impulse response of input top adder output path is (1, 1, 1) and input bottom adder output path is (1, 0, 1) and also message signal is 10011.

(d) Sketch the code tree for the convolution coder shown with $k = 1, n = 2$. Write the step also.



Unit-V

5. (a) What is Euclidean Distance?

(b) Explain the process of mapping by set partitioning. Why it is done?

(c) Draw the General structure of TCM Encoder and write TCM design rule.

(d) Explain in brief about BCH codes and what is the importance of minimal polynomial? How BCH codes are decoded.

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C028633(028)

B. Tech. (Sixth Semester) Examination, April-May 2022

(AICTE Scheme)

(Electronics & Telecommuniction Engg. Branch)

ARM SYSTEM ARCHITECTURE

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) of each question is compulsory, carrying 4 marks. Attempt any* ***two*** *parts from (b), (c) & (d) from each questions, each carrying 8 marks.*

Unit-I

1. (a) Discriminate between the ARM & Thumb mode of operation.

(b) Explain the pipelining concept of ARM7 version and also evaluate the pipeline speed, efficiency and throughput. Also explain why stall cycles addd sometimes in the pipeline?

(c) What are the different processing modes of ARM7 briefly explain with the required set of registers in each?

(d) What is the difference between RISC and CISC architecture of processors?

Unit-II

2. (a) Brief on the ARM9TDMI nomenclature.

(b) What do you mean by AMBA bus architecture of ARM? What are AHB/API types of AMBA?

(c) What do you mean by FPU in ARM processors? Write multiplication method with and without FPU unit in ARM.

(d) Briefly explain 5 stages of pipelining in ARM9 with its architectural block diagram and also explain the need of both multiplier, barrel shifter and control unit in instruction execution.

Unit-III

3. (a) Write the difference between Branch (B) and Branch link (BL) operation of ARM codes.

(b) Write a program to transfer the 128 bytes of data from source location 'SCR' to the destination location 'DST' with the help of multiple register load store operation of ARM also brief multiple register load store operation.

(c) Briefly explain the working of following instruction.

(i) SUB r0, r1, r2

(ii) RSB r0, r1, r2

(iii) SBC r0, r1, r2

(iv) EOR r0, r1, r2

(v) BIC r0, r1, r2

(vi) TSC r0, r1, r2

(vii) TEQ r0, r1, r2

(viii) LDR r0, [r2, #4]

(d) What do you mean by Memory mapped I/O? Why it is used in ARM7 TDMI architecture but not in ARMTDMI9?

Unit-IV

4. (a) Write the difference between Interrupts and Exception.

(b) What do you mean by ARM & Thumb inter working?

(c) What are the different Exceptions and their priories with vector addresses of ARM7? Also explain the different process mode of the ARM pertaining to each exception.

(d) Briefly explain the Arm Developer suits used to simulate the ARM programming along with the necessary C library.

Unit-V

5. (a) Write the difference between Stack and Heap.

(b) Draw and explain the ROM/RAM Remapping of ARM based system also figure out the reserve portion for the exception vector table, data segment and stack segment in memory mapping.

(c) Briefly explain the process handling of nested interrupt in ARM based system.

(d) How the variables get allocated in the stack heap? Briefly explain with the help of suitable C programming. Also write suitable C code to explain the stack overloading.

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C028634(028)

B. Tech. (Sixth Semester) Examination, April-May 2022

(AICTE Scheme)

IMAGE PROCESSING & REMOTE SENSING

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all the questions. Part (a) is compulsory from each unit and attempt any* ***two*** *questions from part (b), (c) and (d).*

Unit-I

1. (a) How to work electromagnetic field energy sources and radiation principles in remote sensing system. 4

(b) Explain about energy interactions with earth surface features and how to work electromagnetic energy with earth surface. 8

(c) Briefly describe about spectral reflectance of earth surface features Types and Spectral reflectance curves. 8

(d) Explain about spectral response patterns and atmospheric influences on spectral response patterns in remote sensing system. 8

Unit-II

2. (a) Explain about Goes satellites, ocean monitoring satellites and earth observing system. 4

(b) Describe about general characteristics of satellite remote sensing systems satellite bus and mission subsystem. 8

(c) How to work Sensor Design Parameters and FWHM in remote sensing system? 8

(d) Explain about resolution systems thematic mapper spectral bands and show the TM band colour combination. 8

Unit-III

3. (a) What is element of Digital Geometry and derive it some important definitions. 4

(b) What is Restoration in image processing? How to estimate Minimum mean-square Error Restoration and Least-square Error Restoration. 8

(c) Describe about Ground reflectance information in earth surface form restoration. 8

(d) Explain about Modern CT systems used a fan-beam geometry. 8

Unit-IV

4. (a) How to used Homomórphic filtering in image Enhancement. 4

(b) Explain about Image Enhancement. How to work in contrast intensification where linear stretching and nonlinear stretching in image enhancement? 8

(c) Consider the following figure where each small rectangle represents a pixel and the value inside it is gray level at the pixel. Hence the whole array

represent a digital image $g(r, c)$ of size 5×5. The centre pixel $g(2, 2)$ is marked by underline 8

0	1	0	6	7
2	0	1	6	5
1	1	7	5	6
1	0	6	6	5
2	5	6	7	6

(d) Explain the Edge-preserving smoothing with standard deviation in image enhancement. 8

Unit-V

5. (a) Describe about advantages and disadvantages of supervised and unsupervised classification. 4

(b) Explain about Supervised and Unsupervised classification form information extraction. 8

(c) Use basic mathematical expression in fuzzy set and its properties. 8

(d) What is the process of Image Extraction using Principal Component Analysis (PCA)? 8

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C028635(028)

B. Tech. (Sixth Semester) Examination, April-May 2022

(AICTE-Scheme)

(ET & T. Engg. Branch)

WIRELESS SENSOR NETWORKS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *All questions are compulsory. Part (a) of each question is compulsory and answer any two parts from (b), (c) & (d) of each question. Part (a) carries 4 marks and parts (b), (c) & (d) carries 8 marks each.*

Unit-I

1. (a) What do you understand by localization? Define it.

(b) Draw the block diagram of wireless sensor node. Explain in detail.

(c) What do you understand by three domain network in network deployment? Explain in detail.

(d) What do you understand by Graded precision localization? Explain in detail.

Unit-II

2. (a) Define the term time synchronization.

(b) Explain fine grained network time synchronization using RBS.

(c) Explain GPS based localization in detail.

(d) Explain clock & communication delay in detail.

Unit-III

3. (a) Define the term topology.

(b) Draw and explain construction topology for connectivity.

(c) Draw and explain Adaptive Self Configuration Sensor Network Topology Control (ASCENT).

(d) What do you understnad by Lightweight Deployment Aware Scheduling (LDAS) explain briefly.

Unit-IV

4. (a) Define the term estimation.

(b) Why congestion occurred. How it will detected define it.

(c) Explain Congestion Detection & Avoidance (CODA). Algorithm for multiple class of traffic sensor network.

(d) Draw architecture of outlier detection techniques for wireless sensor network and explain statistical based approaches.

Unit-V

5. (a) Define term data centric network.

(b) Explain direct diffusion data-centric routing in detail.

(c) Explain leach protocol in detail.

(d) What do you understand by querying? Explain in detail.