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Seventh Semester B.E. Degree Examination, June/July 2018
Computer Communication Networks

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1 a. Match the following functions to the appropriate layers in the OSI model :
 - i) Reliable process – to – process message delivery.
 - ii) Route selection.
 - iii) Dividing the transmitted bit stream into frames.
 - iv) Provides user services such e-mail and File transfer.
 - v) Transmission of bit stream across physical medium. (05 Marks)
 - b. Give a brief over of SS7 signaling. (05 Marks)
 - c. With diagram, explain TCP / IP protocol stack. (06 Marks)
 - d. Calculate the minimum time required to download 0.5 million bytes of information using of the following technologies :
 - i) V 32 modem ii) V 90 modem iii) ADSL modem iv) Cable modem. (04 Marks)
- 2 a. What is Framing? How frames can be classified? Explain bit stuffing and destuffing with an example. (10 Marks)
 - b. With necessary figures, explain the stop and wait ARQ protocol for noisy channels. (10 Marks)
- 3 a. Explain CSMA and show the behaviour of the three persistence methods of CSMA. Compare the vulnerable times in CSMA and CSMA/CD. (10 Marks)
 - b. A slotted ALOHA network transmits 500 bit frames using a shared channel with 500 Kbps bandwidth. Find the throughput if the system produces 500 frames / sec. (04 Marks)
 - c. Explain Polling & token passing in controlled access method. (06 Marks)
- 4 a. Give the four generation of Ethernet and their data rates. (04 Marks)
 - b. Explain the following with respect to Fast Ethernet :
 - i) Implementation ii) Encoding iii) 100 – BASE – TX. (06 Marks)
 - c. What is Hidden station and exposed station problem? How it can be solved? (10 Marks)

PART – B

- 5 a. Explain each of the following in brief :
 - i) Passive hub ii) Repeater iii) Bridge iv) Router. (08 Marks)
 - b. What are Transparent bridges? Explain the process of learning in transparent bridges. Which factors create looping problems in Transparent bridge. (08 Marks)
 - c. Briefly explain VLAN. (04 Marks)
- 6 a. What is Class less addressing in IP V₄? What is Mask? Explain. (06 Marks)
 - b. What are different strategies used in the transition of IP V₄ to IP V₆? (09 Marks)

c. Find the error if any, in the following IP V₄ addresses :

- i) 324.74.31.12 ii) 201.14.7.24.3 iii) 10001.23.14.67
- iv) 24.211.045.71 v) 221.218.44

(05 Marks)

7 a. Compare IP V4 and IP V6 headers.

(04 Marks)

b. List and explain three forwarding techniques

(06 Marks)

c. With necessary diagram, explain Path Vector Routing (PVR) protocol.

(10 Marks)

8 a. List the TCP features. Explain TCP segment format with diagram.

(10 Marks)

b. With diagram, explain Recursive and Iterative resolution.

(10 Marks)

Seventh Semester B.E. Degree Examination, June/July 2018
Optical Fiber Communication

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
atleast TWO questions from each part.**

PART – A

- 1 a. Using Snell's law, derive an expression for numerical aperture of a fiber optic cable. (08 Marks)
- b. Explain total internal reflection and photonic crystal fibers. (06 Marks)
- c. A graded index fiber has a core with a parabolic refractive index profile which has a diameter of 50 μm . The fiber has a numerical aperture of 0.2. Find total number of guided modes propagating in the fiber when it is operating at a wavelength of 1 μm . (06 Marks)
- 2 a. Derive an expression for pulse spreading due to material dispersion. (08 Marks)
- b. Explain fiber bending loss with neat diagram. (08 Marks)
- c. A 6 km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive index difference of 1%. Estimate the delay between the slowest and fastest modes at the fiber output and also find the rms pulse broadening due to intermodal dispersion on the link. (04 Marks)
- 3 a. A double-heterojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radioactive and non radioactive recombination times of 30 and 100 ns, the derive current is 40 mA. Find the recombination life time and internal power generated. (06 Marks)
- b. Explain the GaAs homojunction injection laser with fabry-perot cavity and also derive its quantum efficiency of the above laser. (08 Marks)
- c. A photodiode has a quantum efficiency of 65% when photons of energy 1.5×10^{-19} J are incident upon it. At what wavelength is photo diode operating and also calculate the incident power required to obtain a photo current of 2.5 μA (Assume $e = 1.602 \times 10^{-19}$). (06 Marks)
- 4 a. Explain the three types of misalignment which occur when joining optical fibers. (08 Marks)
- b. Discuss about star coupler and also give its splitting and excess loss. (06 Marks)
- c. An optical fiber has a core refractive index of 1.5. Two lengths of the fiber with smooth and perpendicular end faces are butted together. Assuming fiber axes are perfectly aligned, calculate optical loss in decibels at the joint. When there is a small air gap between the fiber end faces. (06 Marks)

PART – B

- 5 a. Derive SNR for Analog receiver. (08 Marks)
- b. Explain the term receiver sensitivity. Derive an equation for receiver sensitivity interms of photodetector noise. (08 Marks)
- c. Explain the basic sections of an optical receiver with neat diagram. (04 Marks)

- 6 a. Derive an expression for carrier to noise ratio of an analog optical fiber communication. (08 Marks)
b. Explain sub-carrier multiplexing technique in detail with neat diagram. (06 Marks)
c. Explain Radio over fiber links. (06 Marks)
- 7 a. Explain the operation of a polarization independent isolator with neat diagram. (06 Marks)
b. Discuss about chromatic dispersion compensator. (06 Marks)
c. Derive an equation for path difference in a 2×2 Mach-Zehnder interferometer. (08 Marks)
- 8 a. Derive an equation for amplifier gain in semiconductor optical amplifiers. (08 Marks)
b. Explain Ultra fast point to point transmission system using optical TDM. (08 Marks)
c. Consider an EDFA being pumped at 980 nm with a 30 mW pump power. If the gain at 1550 nm is 20 dB. Find the maximum input and output power of the amplifier. (04 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2018
Power Electronics

Time: 3 hrs.

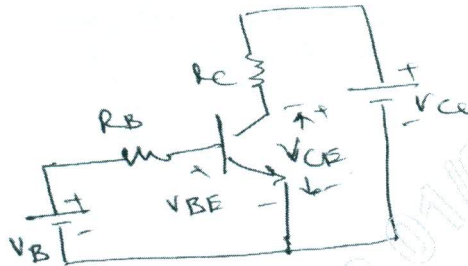
Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1
 - a. What is a Power Converter? List the different types of power – converters and mention their conversion function. (10 Marks)
 - b. With a neat diagram and waveforms of control signal and output voltage, explain the control characteristics of IGBT and SCR. (06 Marks)
 - c. Discuss the peripheral effects of power electronics equipments. (04 Marks)
- 2
 - a. With the help of switching waveforms, explain the switching times of a power transistor. (06 Marks)
 - b. Explain how anti – saturation base drive control improves the switching performance of BJT. (06 Marks)
 - c. The beta (β) of BJT, shown in fig.Q2(c) varies from 12 to 75. The load resistance $R_C = 1.5\Omega$. The dc supply voltage $V_{CC} = 40V$ and input voltage to base circuit is $V_B = 6V$. If $V_{CE}(\text{sat}) = 1.6V$, $R_B = 0.7V$. Determine (08 Marks)
 - i) Overdrive factor
 - ii) The forced Beta
 - iii) The power loss.

Fig.Q2(c)



- 3
 - a. Explain the principle of a SCR using two transistor model. (06 Marks)
 - b. Explain the turn – on and turn – off characteristics of SCR. (08 Marks)
 - c. The latching current of a SCR inserted in between a dc voltage source of 200V and load is 100mA. Calculate the minimum width gate pulse current required to turn on this SCR in case the load consists of
 - i) $R = 20\Omega$ in series with $L = 0.2H$
 - ii) $R = 20\Omega$ in series with $L = 2.0H$.(06 Marks)
- 4
 - a. Explain briefly the half – wave controlled rectifier with RL load and derive the equation for output voltage. (08 Marks)
 - b. Explain briefly the single – phase dual converters with circuit diagram and waveform. (08 Marks)
 - c. A single phase fully controlled bridge rectifier is fed from 230V, 50Hz supply. The load is highly inductive. Find the average load voltage and current if the load resistance is 10Ω and firing angle is 45° . (04 Marks)

PART – B

- 5 a. With a neat circuit diagram and waveforms, explain the complementary commutation and derive the necessary equations. (10 Marks)
- b. Draw the circuit diagram of self commutation and explain briefly with waveforms and derive equations necessary. (10 Marks)
- 6 a. What is an AC – voltage controller? With the help of waveform, explain ON – OFF controller. (06 Marks)
- b. Explain the operations of a single – phase bidirectional controller with resistive load. Obtain the necessary equations and also draw the waveforms. (08 Marks)
- c. A single phase full wave voltage controller has a input voltage of 230V and a load having 10Ω , i.e $R = 10\Omega$. If the firing angle is 45° , calculate the power absorbed by the load $f = 50\text{Hz}$. (06 Marks)
- 7 a. Explain the principle of operation of a step – up chopper. (06 Marks)
- b. With a neat circuit diagram, explain the working of impulse commutated thyristor chopper. (08 Marks)
- c. A DC chopper has a resistive load of 20Ω and input voltage 220V. When chopper is ON its voltage drop is 1.5V and chopping frequency is 10KHz. If the duty cycle is 80% , determine the average output voltage and rms output voltage and the chopper on time. (06 Marks)
- 8 a. Explain briefly the half bridge inverter with inductive load using circuit diagram and waveforms. (06 Marks)
- b. Explain the performance parameters of inverters. (08 Marks)
- c. Explain the variable DC link inverter with circuit diagram and waveforms. (06 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2018
Wireless Communication

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1
 - a. Explain the signaling system # 7 components, with a neat diagram. (08 Marks)
 - b. With a timeline diagram, explain AMPS mobile initialization. (08 Marks)
 - c. AMPS has channel spacing of 30KHz. Transmitter frequency for MS is 825.030 MHz and BS is 870.030 MHz. Determine the downlink and uplink frequencies of AMPS channel 326 on the A side channels. What type of channel is it? (04 Marks)
- 2
 - a. With a neat block diagram, explain the common cellular system components. (10 Marks)
 - b. Explain the hardware and software view of a cellular network, with suitable diagrams. (07 Marks)
 - c. Explain : i) IMEI ii) IMSI. (03 Marks)
- 3
 - a. Explain Cell sectoring and Cell splitting with their advantages and disadvantages. (08 Marks)
 - b. Explain the various methods to achieve efficient channel allocation. (06 Marks)
 - c. Describe the power control schemes used in wireless networks. (06 Marks)
- 4
 - a. Explain the various logical channels in GSM. (10 Marks)
 - b. With a neat diagram, explain the GSM network architecture. (10 Marks)

PART – B

- 5
 - a. Explain the inter BSC handover in GSM, with suitable diagram. (10 Marks)
 - b. Discuss the call initialization operation in GSM with timeline diagram. (10 Marks)
- 6
 - a. Explain the basic spreading procedure on forward channels in CDMA, with a neat diagram. (10 Marks)
 - b. Explain the following with respect to CDMA :
 - i) Soft handoff ii) Softer handoff iii) Soft – Softer handoff. (06 Marks)
 - c. Explain the uses of functional planes of CDMA 2000 MSC – BSC interface. (04 Marks)
- 7
 - a. With a block diagram, explain the working of RAKE receiver used for CDMA. (10 Marks)
 - b. Explain the following spread spectrum modulation techniques in detail :
 - i) Frequency hopping ii) Direct sequence. (10 Marks)
- 8
 - a. With a neat diagram, explain the Bluetooth protocol stack. (10 Marks)
 - b. Compare and contrast WLAN and WPAN. (06 Marks)
 - c. Write a note on IEEE 802.16 WMAN (WiMax). (04 Marks)

Seventh Semester B.E. Degree Examination, June/July 2018
Embedded System Design

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Compare (i) Soft real time system and Hard real time system (ii) Microprocessor and microcontroller. (04 Marks)
- b. Define embedded system and give 4 examples. With a block schematic, explain the function of the various units in a microprocessor based embedded system. (08 Marks)
- c. With a flow diagram, explain the embedded system life cycle and also distinguish between traditional and contemporary design approaches. (08 Marks)
- 2 a. Compare (i) Big Endian and Little Endian formats (ii) Truncation and Rounding of numbers (iii) Direct and Register Direct addressing. (06 Marks)
- b. Let $E = 100 \text{ VDC} \pm 1\%$, $I = 10\text{A} \pm 1\%$ and $R = 10\Omega \pm 1\%$. Determine the range of power measured using three different formulae for measurement of power, using a measurement system. (06 Marks)
- c. Write the RTN model of datapath and memory interface to a microprocessor and explain the function of the registers involved. For the 4 steps in an instruction cycle, explain the function and write ISA and RTL level instruction with an example. (08 Marks)
- 3 a. With diagrams distinguish between,
 - (i) SRAM and DRAM.
 - (ii) Direct mapped and associate mapped cache memories. (08 Marks)
- b. Explain (i) DRAM write timing diagram and (ii) DRAM refresh operation. (06 Marks)
- c. Write the memory interfacing diagram to design a $4\text{K} \times 16$ bits SRAM, using $1\text{K} \times 8$ bit SRAM chips. Also write SRAM read timing diagram. (06 Marks)
- 4 a. Explain waterfall and V Life cycle models for embedded system design and development. (10 Marks)
- b. Describe the system design specification and system functional specification for a digital counter with values assumed and necessary diagrams. (10 Marks)

PART – B

- 5 a. Define the four categories of multitasking operating system, with processes and threads. (04 Marks)
- b. With a state diagram, explain the functions of the various states and also the various fields in the task control block with its diagram, in the Task management function of OS. (08 Marks)
- c. Explain (i) Reentrant code (ii) Foreground / Background system (iii) Multiple Processes and (iv) Light weight threads and Heavy weight threads. (08 Marks)
- 6 a. Compare (i) User mode and supervisor mode (ii) Programs and Processes. (04 Marks)
- b. With a diagram, explain the functions of the various layers in a high level operating system architecture. (08 Marks)
- c. Write a C code for a simple operating system Kernel which uses a shared data buffer and Task control Block for asynchronous communication of three tasks for an application. (08 Marks)

- 7 a. Explain Amdahl's law with an equation and an example for the speed of execution. **(04 Marks)**
b. Describe the time complexity analysis and Big-O notation for algorithm. **(08 Marks)**
c. Analyze the selection sort algorithm for time complexity with sequence of steps and a C code for the same. **(08 Marks)**
- 8 a. Explain (i) Time loading (ii) Instruction counting and (iii) Preemptive scheduling. **(06 Marks)**
b. Explain total memory loading with an example and formula. How individual memory loading is calculated for each area in the memory map? **(06 Marks)**
c. Describe atleast 8 tricks of the trade for reducing the response time and time loading. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2018
DSP Algorithms and Architecture

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Explain digital signal processing with a neat block diagram. (04 Marks)
- b. Explain discrete time sequence in detail. Determine the periods for the periodic sequences ,
(i) $e^{\frac{jn\pi}{8}}$ (ii) $e^{-\frac{jn3\pi}{8}}$ (08 Marks)
- c. Mention the difference between FIR and IIR filters. Find the magnitude and phase response of an FIR filter represented by the difference equation, $y(n) = 0.5x(n) - 0.5x(n-1)$ (08 Marks)
- 2 a. How does the barrel shifter in a DSP works? Explain with an example. (06 Marks)
- b. With a neat block diagram, explain the working of MAC unit. (06 Marks)
- c. Explain the bit reversed addressing mode for a 16 point FFT with a neat diagram and step by step generation of binary code. (08 Marks)
- 3 a. Compare architectural features of TMS320C25, DSP56000 and ADSP2100 fixed point DSP. (06 Marks)
- b. Explain any five addressing modes of TMS320C54XX with one example each. (10 Marks)
- c. Identify the addressing modes of the source operand in each of the following instructions:
(i) ADD, *AR2+OB, A (ii) ADD *AR2+, A (iii) ADD *AR2+%, A (iv) ADD #23h, A (04 Marks)
- 4 a. Explain the following assembler directives of TMS320 DSP processor :
(i) .mmregs (ii) .data (iii) .text (iv) .bss (04 Marks)
- b. Write a program to find the sum of series of signed number from address 410H to 41FH given by $A = \sum dmad$. (08 Marks)
- c. Explain with one example each the four types of classifications of assembly language instructions of TMS320 DSP processor. (08 Marks)

PART – B

- 5 a. Determine the values respresented by the 16 bit fixed point number $N_1 = 4D00$ and $N_2 = CDCAH$ in Q7 and Q15 notation. (04 Marks)
- b. Write an ALP for the FIR filter with 200 input samples using 16 length circular buffers for the TMS320 DSP. (10 Marks)
- c. Write an ALP to multiply two Q15 numbers to produce a Q15 result for the TMS320 DSP. (06 Marks)
- 6 a. Explain scaling operation in DSP processor and derive the expression for optimal scaling factor for DIT FFT butterfly algorithm. (08 Marks)
- b. Write a pseudo code to determine 8 point DFT using DIT FFT algorithm invoking butterfly subroutine in a nested loop for each stage. (12 Marks)
- 7 a. Explain the working of DMA with respect to the TMS320 DSP processor. (08 Marks)
- b. Explain the working of interrupts in TMS320 DSP. (08 Marks)
- c. Explain the memory space organization of TMS32054XX DSP. (04 Marks)
- 8 a. Explain the working of PMC 3002 CODEC with neat block diagram. A PMC 3002 is programmed for 12 kHz sampling rate, determine the divisor N to be written to the CPLD of the DSK and various clock frequencies. (08 Marks)
- b. Explain the biotelemetry receiver system with the help of a block diagram. (06 Marks)
- c. Explain with a block diagram clipping auto correlation speech detector. (06 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2018
Operating Systems

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
atleast TWO questions from each part.**

PART – A

- 1 a. Explain goals of an operating system. (06 Marks)
- b. Explain functions of multiprogramming operating system with architectural support. (08 Marks)
- c. Describe partition based resource allocation. (06 Marks)
- 2 a. With neat diagram explain layered design of operating system. (08 Marks)
- b. Explain the working of microkernel based operating system with diagram. (08 Marks)
- c. Write note on Virtual machine operating system. (04 Marks)
- 3 a. Explain 4 kinds of process interaction. (08 Marks)
- b. With neat diagram explain fundamental process state transitions. (06 Marks)
- c. Describe kernel level thread with diagram. (06 Marks)
- 4 a. Explain with neat diagram memory allocation model for a process. (08 Marks)
- b. Compare contiguous and non contiguous memory allocation methods. (06 Marks)
- c. Describe buddy system allocator. (06 Marks)

PART – B

- 5 a. Explain with diagram demand paging along with address translation. (10 Marks)
- b. Explain First In First Out page replacement policy and find the number of page fault in the following page reference string by applying FIFO page replacement policy. Assume page frame = 3.
Page Reference String : 5 4 3 2 1 4 3 5 4 3 2 1 5 (10 Marks)
- 6 a. With neat diagram describe facilities provided by File system and IOCS. (08 Marks)
- b. Describe sequential file organization. (06 Marks)
- c. Write note on Unix file system. (06 Marks)
- 7 a. Explain with schematic diagram concept of scheduling. (06 Marks)
- b. Explain with block diagram event handling actions of kernel and long term, medium term, short term schedulers. (08 Marks)
- c. Explain Real time scheduling. (06 Marks)
- 8 a. Write note on mail boxes and its advantages. (08 Marks)
- b. Explain three inter process communication features supported by Unix. (08 Marks)
- c. Explain interprocess message control block (IMCB) (04 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2018
Real Time Systems

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Define Real Time Systems. How they are different from other regular systems? (06 Marks)
b. Give the classification of Real Time Systems and give suitable applications. (06 Marks)
c. Write the block diagram of a computer control system in an industry and explain its operation. (08 Marks)
- 2 a. Describe the computer control process in the following operations with the help of diagrams.
i) Sequential control ii) Loop control iii) Supervisory control. (15 Marks)
b. Explain the working principle of centralized computer control in the industry. (05 Marks)
- 3 a. What are parallel computers? Write the different architectures of parallel computer systems and explain their working principles. (08 Marks)
b. Explain with suitable diagrams the process related interfaces. (06 Marks)
c. Describe the Interrupt driven data transfer and DMA data transfer, working principles. (06 Marks)
- 4 a. Discuss the features that a real time language should possess in order to meet the real time applications. (09 Marks)
b. Explain, how the compilation of programs is carried out in the real time systems? (05 Marks)
c. Write the diagram of table driven application system and explain the working. (06 Marks)

PART – B

- 5 a. Write the block diagram of multitasking operating system and explain its functioning. (10 Marks)
b. Discuss the task priority structures employed in the real time systems. (10 Marks)
- 6 a. What is task management? Explain the total task management process in the real time systems, with the help of suitable diagrams. (12 Marks)
b. What is code sharing? How it is carried out in the multi tasking system. (08 Marks)
- 7 a. Write the typical planning phase and development phase diagrams of RTS design process and explain. (12 Marks)
b. Describe :
i) Fore ground and back ground system
ii) Semaphores. (08 Marks)
- 8 a. Discuss the i) Yourdon methodology ii) Ward and Mellor methods of RTS developments. (14 Marks)
b. Write note on Hatley and Pirbhai methodology of designing RTS. (06 Marks)

Seventh Semester B.E. Degree Examination, June/July 2018
Image Processing

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. With neat block diagram, explain the components of general purpose Image processing system. (12 Marks)
- b. Explain with neat diagram, the structure of human eye. (08 Marks)
- 2 a. Explain image acquisition using sensor arrays. (08 Marks)
- b. Explain with neat diagrams the basic concepts of image sampling and quantization. (12 Marks)
- 3 a. Starting from two dimensional discrete Fourier transform expressions deduce two dimensional unitary discrete Fourier transforms. (06 Marks)
- b. List any five properties of unitary discrete Fourier transforms. (05 Marks)
- c. If $A = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$ is unitary matrix, $U = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ an image, determine the unitary transformed Image and find the basis image of 'A'. (09 Marks)
- 4 a. Define discrete sine transform? List any five properties of it. (08 Marks)
- b. Define Hadamard transform. Generate 4×4 hadamard matrix. (08 Marks)
- c. List any four properties of hadamard transforms. (04 Marks)

PART – B

- 5 a. Explain contrast stretching and bit plane slicing piecewise linear transformation techniques. (10 Marks)
- b. Explain histogram equalization technique. (10 Marks)
- 6 a. List the frequency domain filtering steps with relevant mathematical expressions and Block diagram. (10 Marks)
- b. Explain any two filtering techniques used in image smoothing. (10 Marks)
- 7 a. What is image Restoration? Explain with neat block diagram image degradation restoration process. (06 Marks)
- b. Explain the following with neat plots and mathematical models : i) Uniform noise ii) Impulse noise. (06 Marks)
- c. Explain with relevant mathematical models Band reject filters and Band pass filters used in periodic noise reduction. (08 Marks)
- 8 a. Explain RGB colour model (08 Marks)
- b. Explain intensity slicing with reference to pseudo colour image processing. (07 Marks)
- c. Explain the terms with reference to colour image processing hue, saturation and intensity. (05 Marks)

CBCS SCHEME

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15EC71

Seventh Semester B.E. Degree Examination, July/August 2021 Microwave and Antennas

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Derive the general transmission line equation to find voltage and current on the line in terms of position 'z' and time 't'. (08 Marks)
b. With a neat diagram, explain the operation of Reflex Klystron. (08 Marks)
- 2 a. Define transmission coefficient. Derive the equation for transmission coefficient of power transmission line. (08 Marks)
b. A transmission line has a characteristic impedance of $75 + j0.01\Omega$ and is terminated in a load impedance of $70 + j50\Omega$. Compute :
i) Reflection coefficient
ii) Transmission coefficient
iii) Verify relation between reflection and transmission coefficient
iv) Verify $T = 1 + \Gamma$. (08 Marks)
- 3 a. Explain non-reciprocal phase shifter with a neat diagram. (08 Marks)
b. In an H-plane T-junction, compute power delivered to the loads of 40Ω and 60Ω connected to arms 1 and 2 when a 10mw power is delivered to the matched port 3. (08 Marks)
- 4 a. What are waveguide tees? Explain its types. (08 Marks)
b. Briefly explain the applications of Magic – T. (08 Marks)
- 5 a. Explain the losses in microstrip lines. (08 Marks)
b. A lossless parallel strip line has a conducting strip width w, the substrate dielectric constant ϵ_{rd} of 6 (BeO) and a thickness 'd' of 4mm. Calculate :
i) Width w of the strip to have a characteristic impedance of 50Ω
ii) Strip-line capacitance
iii) Strip-line inductance
iv) Phase velocity of wave in parallel strip line. (08 Marks)
- 6 a. Define directivity. Derive the relation between :
i) Directivity and beam solid angle
ii) Directivity and effective aperture. (08 Marks)
b. Show that maximum effective aperture of $\lambda/2$ dipole (A_{em}) = $0.13\lambda^2$ and Directivity = 1.63. (08 Marks)

- 7 a. Derive an expression and draw the field pattern for an array of two isotropic point sources with equal amplitude and opposite phase. (08 Marks)
- b. Find the power and directivity of :
- i) $U = U_m \sin^2 \theta$ for $0 \leq \theta \leq \pi$; $0 \leq \phi \leq 2\pi$
- ii) $U = U_m \cos^2 \theta$ for $0 \leq \theta \leq \pi/2$; $0 \leq \phi \leq 2\pi$. (08 Marks)
- 8 a. Derive the radiation resistance of thin $\lambda/2$ antenna. (08 Marks)
- b. Explain :
- i) Power theorem
- ii) Multiplication pattern. (08 Marks)
- 9 a. Derive the radiation resistance of small loop. (08 Marks)
- b. Explain in brief with neat figure.
- i) Horn Antenna
- ii) Yagi Uda Antenna. (08 Marks)
- 10 a. With neat diagram, explain the following
- i) Log periodic antenna
- ii) Helical antenna. (08 Marks)
- b. Find the directivity, beam width and effective area of the parabolic reflector for which the reflector diameter is 6m and aperture efficiency is 0.65. The frequency of operation is 10GHz. (08 Marks)

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CBCS SCHEME

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15EC72

Seventh Semester B.E. Degree Examination, July/August 2021 Digital Image Processing

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Explain the fundamental steps in digital image processing along with a block schematic. (08 Marks)
- b. Define horizontal neighbors, vertical neighbors and diagonal neighbors for pixel $p(x, y)$. Also determine the three distance measures between $p(x, y)$ and $q(s, t)$ in Fig.Q1(b), where coordinate starts with $(0, 0)$ in this grayscale image.

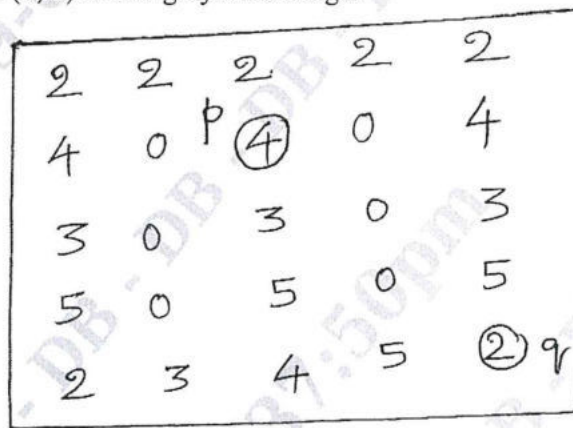


Fig.Q1(b)

(08 Marks)

- 2 a. Explain image acquisition using single sensor, sensor strips and sensor arrays with relevant diagrams. (09 Marks)
- b. Explain 4-adjacency, 8-adjacency and a region, linear and non-linear operators in image processing, for a 2-dimensional image with an example for each. (07 Marks)
- 3 a. Explain image negative, log transformation and power-law transformation with equations and figures. (06 Marks)
- b. Explain histogram equalization for the given set of values in Table.Q3(b), determine the equalized histogram for a 3-bit image of size 64×64 pixels.

K	0	1	2	3	4	5	6	7
r_K	0	1	2	3	4	5	6	7
n_K	790	1023	850	656	329	245	122	81

Table.Q3(b)

(10 Marks)

- 4 a. Explain the 7 steps used for filtering in the frequency domain. Define 2-D convolution theorem. (06 Marks)
- b. Describe image sharpening using the following frequency domain filters:
- (i) Ideal highpass filter
 - (ii) Butterworth highpass filter
 - (iii) Gaussian highpass filter
- (10 Marks)

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.

- 5 a. Explain Gaussian, Rayleigh and Erlang noise models with equations and graphs. (06 Marks)
b. Describe adaptive local noise reduction filter and adaptive median filter used for removing noise in images. (10 Marks)
- 6 a. Explain arithmetic mean, geometric mean and median filter with equations and their usage for noise removal in images. (06 Marks)
b. Describe bandreject, bandpass and notch filters used for reduction of periodic noise with equations and figures. (10 Marks)
- 7 a. Explain the RGB color model with a cube structure and color equivalent values. Write the equations to convert RGB to HIS and HIS to RGB for color components. (10 Marks)
b. Briefly explain the subband coding with a block diagram of a simple digital filter and impulse response for the input $f(n) = \delta(n)$. (06 Marks)
- 8 a. Explain erosion and dilation operations along with their duality equations and examples with images. (08 Marks)
b. Describe opening and closing operations along with their duality equations and examples with images. (08 Marks)
- 9 a. Explain how isolated points and lines can be detected in images using derivatives and Laplacian mask respectively. (08 Marks)
b. Describe Canny edge detection method with equations and figures. (08 Marks)
- 10 a. Explain boundary following and chain codes used for representation for describing regions. (08 Marks)
b. Describe the MPP algorithm and its illustration with an example of vertices. (08 Marks)

CBCS SCHEME

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15EC73

Seventh Semester B.E. Degree Examination, July/August 2021 Power Electronics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- What is Power Electronics? With the help of block diagram explain it. Explain any four applications of power electronics. (06 Marks)
 - With the transient model of MOSFET explain switching its characteristics. (06 Marks)
 - Compare between Bipolar Junction Transistor (BJT) and MOSFET. (04 Marks)
- What are the peripheral effects of power electronic convertor system? (04 Marks)
 - Explain briefly any two types of power electronic convertors. (04 Marks)
 - Explain $\frac{di}{df}$ and $\frac{dv}{dt}$ protection for transistor. (08 Marks)
- The SCR shown in Fig.Q3(a) has latching current of 40mA and is triggered by the pulse width of 50 μ sec. Determine whether the SCR turn ON or not.

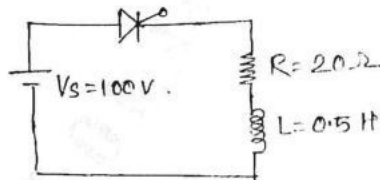


Fig.Q3(a)

- (04 Marks)
 - With the two transistor analogy of thyristor obtain the equation for anode current. (06 Marks)
 - Explain the operation of a full wave RC triggering circuit with waveforms. (06 Marks)
- Explain class B LC communication with necessary circuit diagram, waveforms and equations. (08 Marks)
 - A UJT is used to trigger the thyristor whose minimum gate triggering voltage is 6.2V. The UJT ratings are : $\eta = 0.66$, $I_p = 0.5\text{mA}$, $I_v = 3\text{mA}$, $R_{B1} + R_{B2} = 5\text{k}\Omega$, leakage current = 3.2mA, $V_p = 14\text{V}$ and $V_v = 1\text{V}$. Oscillator frequency is 2KHz and capacitor $c = 0.04 \mu\text{F}$. Design the complete circuits. (08 Marks)
 - Explain the working of single phase half wave controlled rectifier connected to resistive load. Derive expression for the average DC output voltage and rms value of output voltage. (08 Marks)
 - With the neat circuit diagram and relevant waveforms explain the working of ON-OFF control for single phase AC voltage. Derive expression for rms output voltage. (08 Marks)

- 6 a. Explain the working of single phase dual converter with neat circuit diagram. Draw relevant waveforms. (08 Marks)
- b. For the single phase bidirectional AC voltage controller, delay angles of thyristors T_1 and T_2 are equal to $\alpha_1 = \alpha_2 = \frac{2\pi}{3}$. The input is $V_s = 120\sqrt{2} \sin 314t$, 50Hz. Calculate :
- rms output voltage
 - input power factor
 - average current through thyristors I_A and
 - rms current of thyristors. (Fig. Q6(b)).

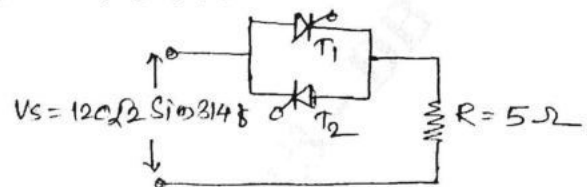


Fig.Q6(b)

(08 Marks)

- 7 a. Explain the working of stepdown chopper for resistive load with circuit diagram and waveform. Derive the expressions for average output voltage $V_{0(av)}$, rms output voltage $V_{0(rms)}$ and output power. (08 Marks)
- b. With the help of circuit diagram and waveforms explain the working of boost regulator. Derive the expression for peak to peak ripple output current and peak to peak ripple output voltage. (08 Marks)
- 8 a. Briefly explain the classification of choppers with circuit diagram, waveforms and quadrant diagram. (08 Marks)
- b. Input to the step-up chopper is 200V. The output required is 600V. If the conduction time of thyristor is 200 μ sec. Compute :
- Chopping frequency
 - If pulse width is halved of for constant frequency find the new output voltage. (08 Marks)
- 9 a. Explain the operation of single phase full bridge inverters supplying resistive load. Derive an expression for output RMS voltage. (08 Marks)
- b. Explain voltage control in inverter by single pulse width modulation and sinusoidal pulse width modulation. (08 Marks)

OR

- 10 a. With neat circuit diagram and waveforms explain transistorized current source inverter. (08 Marks)
- b. Write short note on solid state relays, and microelectronic relays. (08 Marks)

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15EC741

Seventh Semester B.E. Degree Examination, July/August 2021 Multimedia Communication

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. With a neat diagram, explain the following multimedia networks in detail.
i) Telephone network
ii) Data network. (08 Marks)
- b. Discuss the QoS parameters used in both circuit switched and packet switched networks. (08 Marks)
- 2 a. Explain the term 'multimedia'. Discuss the basic form of representation of text an image, audio and video. (04 Marks)
- b. Derive the maximum block size that should be used over a channel which has mean BER probability of 10^{-4} , if the probability of a block containing an error and hence being discarded is to be 10^{-1} . (04 Marks)
- c. Explain the operation of circuit switched and packet switched networks. (08 Marks)
- 3 a. Explain the following :
i) Hyper text
ii) Raster scanning. (06 Marks)
- b. With the help of diagram, explain the working of digital cameras. (06 Marks)
- c. Derive the bit rate and the memory requirements to store each frame that result from the digitization of both 525 – line and a 625 –line system, assuming a 4 : 2 : 2 format. Also find the total memory required to store a 1.5 hour movie/video. (04 Marks)
- 4 a. With a neat sketch, explain the principle of operation of interlaced scanning. (06 Marks)
- b. Derive the time to transmit the following digitized images at both 64kbps and 1.5Mbps
A $640 \times 480 \times 8$ VGA compatible image
A $1024 \times 768 \times 24$ SVGA compatible image. (04 Marks)
- c. Explain the following digital video formats :
i) 4 : 2 : 2 ii) 4 : 2 : 0. (06 Marks)
- 5 a. With the help of block diagram, explain JPEG encoder. (08 Marks)
- b. Encode the string 'went•', comprising characters with probabilities of $e = 0.3$, $n = 0.3$, $t = 0.2$, $w = 0.1$, $\bullet = 0.1$ using arithmetic coding. (04 Marks)
- c. What are the main features of DMS? (04 Marks)

- 6 a. A series of messages is to be transferred between two computers over a PSTN. The messages comprise just the characters A through H. Analysis has shown that the probability (relative frequency of occurrence) of each character is as follows :
A and B = 0.25, C and D = 0.14, E, F, G and H = 0.055. Use Huffman coding to derive a codeword set and prove this is the minimum set by constructing the corresponding Huffman code tree. (06 Marks)
- b. Write short notes on Lempel – Ziv coding. (04 Marks)
- c. With the help of diagram, explain the integrated management architecture for IP – based networks. (06 Marks)
- 7 a. Discuss about the ADPCM subband encoder and decoder. (08 Marks)
- b. With necessary schematic, explain MPEG – 4 coding principles. (08 Marks)
- 8 a. With the help of diagram, explain the working of LPC signal encoder and decoder. (08 Marks)
- b. Explain H-261 video compression standard with the help of macro block format frame format and GOB structure. (08 Marks)
- 9 a. Discuss about the NTI and CTI reconstruction schemes used in packet voice transmission. (08 Marks)
- b. Explain the multiplexing techniques used in ATM networks. (08 Marks)
- 10 a. With the help of necessary diagram, explain the video streaming across the internet. (08 Marks)
- b. Discuss about the different Error–Resilient video coding techniques. (08 Marks)

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15EC744

Seventh Semester B.E. Degree Examination, July/August 2021 Cryptography

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

1. a. With the help of Euclidean Algorithm, obtain the Greatest Common Divisor (GCD) of 1160718174 and 316258250. (06 Marks)
b. Obtain Additive and multiplicative inverse of Modulo 8. (07 Marks)
c. List out the properties of congruences. (03 Marks)
2. a. Show that $\{F, +, X\}$ is a field with respect to binary operations called addition and multiplication. (06 Marks)
b. Find the multiplicative inverse of $x^2 + x + 1$. (05 Marks)
c. List the properties of Modular Arithmetic for Integers in Z_n . (05 Marks)
3. a. Apply play-fair cipher technique for the keyword "CRYPTOGRAPHY" with the plain text "WILLIAM STALLINGS". (05 Marks)
b. Explain in detail Feistel Encryption and Decryption. (07 Marks)
c. Write short note on Steganography. (04 Marks)
4. a. With an Neat Block diagram, brief out model of symmetric cryptosystem. (05 Marks)
b. Obtain Ciphertext for the given plain text "PAYMOREMONEY" by applying HILL CIPHER technique using key
$$K = \begin{bmatrix} 17 & 17 & 5 \\ 21 & 18 & 21 \\ 2 & 2 & 19 \end{bmatrix}$$

(Consider $A = 0, B = 1, C = 2, \dots, Z = 25$). (06 Marks)
c. Explain Data Encryption Standards (DES) Encryption. (05 Marks)
5. a. Explain AES Encryption process. (08 Marks)
b. Explain the following:
i) Alternating stop and Go Generator. (08 Marks)
ii) Bilateral stop and Go Generator. (08 Marks)
6. a. Explain Linear Feedback shift register. (04 Marks)
b. Explain the following:
i) Generalized Geffe Generator
ii) Jennings Generator
iii) Self Decimated Generator. (12 Marks)

- 7 a. State and Prove Euler's Theorem. (06 Marks)
b. Perform Encryption and Decryption using RSA algorithm given Public key is 7 for two prime Numbers 17 and 31 with message 2. (06 Marks)
c. Explain Abelian Group. (04 Marks)
- 8 a. Prove that $7^m = 1 \pmod{19}$ with the help of Discrete Logarithms. (06 Marks)
b. Users A and B use the Diffie-Hellman key exchange technique with a common prime 71, and its primitive root 7,
i) If user A has private key $X_A = 5$, find Y_A .
ii) If user B has private key $X_B = 12$, find Y_B .
iii) What is the shared secret key? (06 Marks)
c. Interpret Two properties of Prime Numbers. (04 Marks)
- 9 a. Explain secure Hash Algorithm. (08 Marks)
b. Explain GOST Digital Signature Algorithm. (08 Marks)
- 10 a. Explain Snefru and N-Hash algorithm with respect Hash functions. (08 Marks)
b. Describe Discrete Logarithm Signature scheme. (08 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021 IOT and Wireless Sensing Networks

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1
 - a. Define IOT and discuss briefly IBM IOT conceptual frame work. (08 Marks)
 - b. Discuss IETF six layer modified OSI model for IOT/M2M systems. (08 Marks)

- 2
 - a. Discuss briefly the Technology behind IOT. (08 Marks)
 - b. With a neat diagram, briefly explain MQTT and XMPP message communication protocol for message interchange between M2M/IOT device objects and web objects. (08 Marks)

- 3

Compare and contrast:

 - a. IPV4 and IPV6 (05 Marks)
 - b. HTTP and HTTPS (05 Marks)
 - c. FTP and TELNET (06 Marks)

- 4
 - a. Discuss 6 LOWPAN protocol stack. (08 Marks)
 - b. With a neat diagram, discuss IOT cloud based data collection, storage and computing services using Nimbits. (08 Marks)

- 5
 - a. What are the features of Arduino IDE that enables the programming task simpler at Arduino platform? (04 Marks)
 - b. List the steps involved while programming of Arduino for usage of analog sensor devices at SPI port. (04 Marks)
 - c. With a neat diagram, discuss briefly five levels for software development for applications and services in IOT or M2M. (08 Marks)

- 6
 - a. List the OWASP-Vulnerabilities in IOT Applications/services. (04 Marks)
 - b. Discuss briefly security function group components with regards to IOT reference architecture. (06 Marks)
 - c. With a neat diagram, discuss a layered attacker model and possible attacks on layers. (06 Marks)

- 7
 - a. What are the major challenges wireless sensor networks are facing? Explain in detail. (10 Marks)
 - b. Describe the enabling technologies for wireless sensor networks. (06 Marks)

- 8
 - a. Describe the single node architecture with appropriate diagram. (08 Marks)
 - b. Explain briefly about requirements for WSN service interface. (08 Marks)

- 9

Write short notes on:

 - a. LEACH (06 Marks)
 - b. SMACS (05 Marks)
 - c. TRAMA (05 Marks)

- 10

Write short notes on:

 - a. Energy efficient routing (05 Marks)
 - b. Geographic routing (05 Marks)
 - c. Hierarchical networks by clustering. (06 Marks)

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15EC755

Seventh Semester B.E. Degree Examination, July/August 2021

Satellite Communication

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Explain Kepler's laws of planetary motion. (09 Marks)
b. A satellite is moving in an elliptical orbit with the major axis equal to 42,000 km. If the perigee distance is 8000 km, find the Apogee and orbit eccentricity. (04 Marks)
c. List the types of satellite orbit. (03 Marks)
- 2 a. Differentiate spin stabilization and body stabilization. (03 Marks)
b. What are the orbital effects on satellite performance? Explain. (07 Marks)
c. Explain look angle and azimuth angle with relevant figures. (06 Marks)
- 3 a. Explain with neat figure the principle of operation of a solar cell. (06 Marks)
b. Write a note on tracking telemetry and command sub system. (08 Marks)
c. What is payload? (02 Marks)
- 4 a. List and explain different types of earth station. (08 Marks)
b. What is receiver figure of merit (G/T)? (02 Marks)
c. Which are the different tasks performed by earth stations satellite tracking system? (06 Marks)
- 5 a. How do you calculate the overall noise to carrier ratio for a satellite link? (02 Marks)
b. Explain in detail SCPC/FM/FDMA system. (08 Marks)
c. With frequency time graph, explain DS-CDMA system, FH-CDMA and TH-CDMA system. (06 Marks)
- 6 a. Explain satellite link parameters which influence the design of a satellite communication link. (08 Marks)
b. Explain fading due to multipath signals for a fixed satellite and mobile satellite terminal. (08 Marks)
- 7 a. With neat block diagram, explain basic elements of a satellite communication system. (10 Marks)
b. What are the advantages of satellites over terrestrial networks? (06 Marks)
- 8 a. Explain typical satellite TV network. (07 Marks)
b. What is DTH? Name the two broadly classified DTH services. (03 Marks)
c. Write a note on VSAT. (06 Marks)
- 9 a. Explain optical remote sensing system with neat figure. (07 Marks)
b. Write a note on LFC camera. (05 Marks)
c. What are monogenic and polygenic secondary images? (04 Marks)
- 10 a. What are weather forecasting satellite orbits? (04 Marks)
b. Write a detailed note on GPS. (08 Marks)
c. Name some applications of satellite navigation system. (04 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021 Cryptography and Network Security

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Explain Euclidean algorithm. Give an example to find the GCD of two large numbers. (08 Marks)
b. Define group, ring, field and cyclic group. (08 Marks)
- 2 a. State and prove Fermat's and Euler's theorem. (08 Marks)
b. Explain substitution Ciphers. (08 Marks)
- 3 a. With a neat diagram, explain Feistel Cipher. (08 Marks)
b. Explain the AES encryption and decryption process with a neat diagrams. (08 Marks)
- 4 a. Distinguish between conventional and public key crypto systems. (04 Marks)
b. What requirement must a public key cryptosystem fulfill to be a secure algorithm? (06 Marks)
c. Explain RSA algorithm. (06 Marks)
- 5 a. Explain N-Hash algorithm with a neat diagram. (08 Marks)
b. Explain secure Hash algorithm. (08 Marks)
- 6 a. Explain digital signature algorithm. (08 Marks)
b. Explain any four MAC. (08 Marks)
- 7 a. Explain the various phases of SSL handshake protocol action. (08 Marks)
b. Explain the two SSL concepts with their parameters. (08 Marks)
- 8 a. Explain SSH protocol stack. (08 Marks)
b. Explain the different phases of operation in IEEE 802.11i Robust security network. (08 Marks)
- 9 a. Explain PGP message transmission and reception with a neat diagram. (08 Marks)
b. Explain functions and cryptographic algorithms used in S/MIME functionality. (08 Marks)
- 10 a. With a neat diagram, explain an IP security scenario. (08 Marks)
b. Explain the ESP packet format. (08 Marks)

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15TE72

Seventh Semester B.E. Degree Examination, July/August 2021 Satellite Communication and Remote Sensing

Time: 3 hrs.

Max. Marks: 80

Note: Answer FIVE full questions.

- 1 a. Explain Historical background of remote sensing. (08 Marks)
b. Explain international space law in detail. (08 Marks)
- 2 a. What is remote sensing? Explain with a neat block diagram. (08 Marks)
b. Explain the benefits of environmental monitoring from satellite sensors. (08 Marks)
- 3 a. Describe the electromagnetic spectrum with respect to remote sensing. (06 Marks)
b. Explain the following terms along with their rotations and units
i) Radiant energy
ii) Radiant flux
iii) Radiant Exitance
iv) Emissivity
v) Spectral Albedo. (10 Marks)
- 4 a. Explain in brief spectral signatures in solar spectrum (08 Marks)
b. Explain the characteristics of electromagnetic radiation in the microwave region. (08 Marks)
- 5 a. Explain in detail different kinds of resolution of a sensor system. (08 Marks)
b. Explain the role of passive sensors in remote sensing. (08 Marks)
- 6 a. Explain the role active sensors in remote sensing. (08 Marks)
b. Explain handsat program in detail. (08 Marks)
- 7 a. Explain what are the constraints in using remote sensing data. (08 Marks)
b. Describe the types of interpretation. (08 Marks)
- 8 a. Explain the organisation of remote sensing project. (08 Marks)
b. Explain the interpretation phase of remote sensing imagery. (08 Marks)
- 9 a. Explain the criteria for visual interpretation. (08 Marks)
b. Explain feature identification. (08 Marks)
- 10 a. Explain the elements of visual analysis in detail. (10 Marks)
b. Explain characteristics of photographic images. (06 Marks)

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15TE73

Seventh Semester B.E. Degree Examination, July/August 2021 CMOS VLSI Design

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Derive the CMOS inverter DC characteristics highlighting the regions of operations. (10 Marks)
b. Write a note on evolution of IC era. (06 Marks)
- 2 a. Explain the steps involved in fabrication of nMOS, with neat diagrams. (10 Marks)
b. Explain the action of enhancement mode transistor for different values of V_{gs} and V_{ds} . (06 Marks)
- 3 a. Give the λ -based design rules for different layers, p and n MOSFETS and contact cuts. (08 Marks)
b. Draw the schematic and stick diagram of CMOS 2-input Nand gate, CMOS 2-input Nor gate. (08 Marks)
- 4 a. Define sheet resistance, sheet capacitance. (06 Marks)
b. Obtain the expression for total delay for N stages of nMOS and CMOS inverters in terms of width factor f and delay τ . (08 Marks)
c. Draw the schematic of $\overline{A + B + C}$ using NMOS technology. (02 Marks)
- 5 a. Write the scale factors for the following parameters:
i) Gate capacitance
ii) Maximum operating frequency
iii) Current density (J)
iv) Power speed product (P_T). (08 Marks)
b. What are the general considerations to be followed in designing a subsystem? (08 Marks)
- 6 a. Explain the various steps involved in designing a 4-bit adder. (08 Marks)
b. Explain Manchester carry-chain element with expressions for inputs and outputs. (08 Marks)
- 7 a. Explain structured design approach for a parity generator. (08 Marks)
b. Design a 4:1 multiplexer using nMOS logic and CMOS logic. (08 Marks)

- 8 a. Explain the architecture of field programmable gate array. (08 Marks)
b. Discuss the FPGA abstractions with a diagram. (08 Marks)
- 9 a. Write and explain 4 transistor dynamic and 6 transistor static CMOS memory cell with sense amplifier. (10 Marks)
b. What are the timing considerations in system design? (06 Marks)
- 10 a. Write a note on test and testability. (08 Marks)
b. Discuss the requirements of I/O pads in a chip. (05 Marks)
c. Discuss observability and controllability. (03 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021 Microwaves and Antennas

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1
 - a. Describe the mechanism of oscillations in case of Reflex klystron. (07 Marks)
 - b. Give the solutions of Transmission line equations and find the expression for phase velocity. (08 Marks)
 - c. A transmission line has following parameters $R = 2\Omega/m$, $G = 0.5\text{mmho/m}$, $f = 1\text{GHz}$, $L = 8\text{nH/m}$, $C = 0.23\text{PF}$.
Calculate:
 - i) Characteristic impedance
 - ii) Propagation Constant. (05 Marks)

- 2
 - a. Define reflection coefficient. Derive the equation for reflection coefficient at the load end at a dist "d" from the load. (07 Marks)
 - b. Describe the different mode curve in the case of reflex klystron. (07 Marks)
 - c. A transmission line has a characteristic impedance of $50 + j0.01\Omega$ and is terminated in a load impedance of $73 - j42.5\Omega$. Calculate:
 - i) Reflection coefficient
 - ii) Standing wave ratio. (06 Marks)

- 3
 - a. State and explain the properties of s-parameters. (07 Marks)
 - b. Explain the working of precision type variable attenuator with a neat diagram. (06 Marks)
 - c. Two transmission lines of characteristic impedance Z_1 and Z_2 are joined at plane PP'. Express s-parameters in terms of impedances. (07 Marks)

- 4
 - a. Draw the diagrams of coaxial connectors and explain. (07 Marks)
 - b. Discuss E plane Tee. Derive its scattering matrix. (06 Marks)
 - c. A 20mW signal is fed into one of collinear port 1 of a lossless H-plane T-junction. Calculate the power delivered through each port when other ports are terminated in matched load. (07 Marks)

- 5
 - a. Find the Quality factor Q_d of microstrip lines. (07 Marks)
 - b. Draw the diagram of parallel strip lines. Find the characteristic impedance of a lossless parallel strip lines. (07 Marks)
 - c. Define the following :
 - i) Antenna
 - ii) Beam efficiency
 - iii) Effective Aperture
 - iv) Directivity. (06 Marks)

- 6
 - a. Explain the concept of shielded strip line and co-planar strip lines with diagrams. (07 Marks)
 - b. Define the following :
 - i) Radiation pattern
 - ii) Radiation Intensity
 - iii) Gain
 - iv) Effective Height. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- c. A radio link has a 15w transmitter connected to an antenna of 2.5m^2 effective aperture at 5GHz. The receiving antenna has effective aperture of 0.5m^2 and is located at a 15km line of sight distance from the transmitting antenna. Assuming lossless matched antennas, find the power delivered to the receiver. (06 Marks)
- 7 a. Explain power theorem and its application to an Isotropic source. (07 Marks)
 b. Explain the principle of pattern multiplication. (07 Marks)
 c. A source has a radiation intensity power pattern given by $U = U_m \sin^2\theta$ for $0 \leq \theta \leq \pi$; $0 \leq \phi \leq 2\pi$. Find the total power and directivity. Draw pattern. (06 Marks)
- 8 a. Derive the equation for radiation Intensity. Explain the concept of field patterns. (07 Marks)
 b. Find the radiation resistance of a $\frac{\lambda}{2}$ Antenna. (07 Marks)
 c. With diagram, explain the concept of Thin linear Antenna. (06 Marks)
- 9 a. Draw the diagram of a loop Antenna and explain. (07 Marks)
 b. Find the radiation resistance of loops, as related of Antenna. (07 Marks)
 c. Explain the working and design consideration of log periodic antenna. (06 Marks)
- 10 a. Explain the concept of Rectangular Horn Antenna. (07 Marks)
 b. Write short notes on :
 i) Yagi-uda Array ii) Parabolic reflector. (07 Marks)
 c. A 16 turn helical beam Antenna has a circumference of λ and turn spacing of $\frac{\lambda}{4}$. Find
 i) HPBW ii) Axial Ratio iii) Directivity. (06 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021 Digital Image Processing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

1.
 - a. Draw the block diagram of General Purpose image processing system and explain it. (08 Marks)
 - b. Explain the process of image sampling and quantization. (08 Marks)
 - c. Let p and q are pixels at co-ordinates (10, 12) and (15, 20) respectively. Find the which distance measure gives minimum distance between them. (04 Marks)

2.
 - a. Discuss the relationship between pixels in details. (08 Marks)
 - b. Consider the image segment,

	3	1	2	①	q
	2	2	0	2	
	1	2	1	1	
p	①	0	1	1	

 Let $V = [0, 1]$, compute the length of 4, 8 and M path between p and q. If a particular path does not exist between p and q explain why? (08 Marks)
 - c. Mention the applications of image. (04 Marks)

3.
 - a. Explain the following intensity transformation functions:
 - (i) Image negatives.
 - (ii) Log transformation.
 - (iii) Power law transformation. (12 Marks)
 - b. Explain Bit plane slicing with example. (08 Marks)

4.
 - a. With the block diagram, and mathematical equations, explain Homomorphic filtering. (10 Marks)
 - b. Explain the Butterworth LPF and Gaussian LPF for image smoothing. (10 Marks)

5.
 - a. Discuss the most commonly used noise probability density functions in image processing applications. (10 Marks)
 - b. Explain the following techniques used for noise removal in image processing:
 - (i) Arithmetic mean filter.
 - (ii) Median filter (10 Marks)

6.
 - a. Explain the followings for periodic noise reduction:
 - (i) Band rejection filters.
 - (ii) Band pass filters. (10 Marks)
 - b. Discuss the three principal way to estimate the degradation function for use in image restoration. (10 Marks)

7.
 - a. Discuss the following color models:
 - (i) RGB color model.
 - (ii) CMY model.
 - (iii) HSI model (15 Marks)
 - b. Given $RGB = (0.683, 0.1608, 0.1922)$ convert this to HSI model. (05 Marks)

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.

- 8 a. Draw the block diagram of pseudo color processing and explain it. (08 Marks)
b. Explain two dimensional four band filter band for subband image coding. (08 Marks)
c. What is duality of a morphological image processing? (04 Marks)
- 9 a. Explain the following of image segmentation:
(i) Line detection (12 Marks)
(ii) Edge detection. (08 Marks)
b. Explain region Splitting and Merging.
- 10 a. Explain the chain codes used to represent a boundary. (08 Marks)
b. Write the Otsu's algorithm used for optimum global thresholding. (08 Marks)
c. What is skeletons? (04 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021 Power Electronics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

1.
 - a. Explain with a neat circuit and waveforms different types of power converters. (10 Marks)
 - b. What are the peripheral effects of power electronic circuits? What are the remedies for them? (06 Marks)
 - c. With circuit diagram, explain the control characteristics of, (i) SCR (ii) MOSFET (04 Marks)

2.
 - a. Draw the switching model of MOSFET and explain its switching characteristics. (08 Marks)
 - b. The bipolar transistor is shown in Fig. Q2 (b) is specified to have β_F in the range of 8 to 40. The load resistance is $R_C = 11\Omega$. The DC supply voltage is $V_{CC} = 200\text{ V}$ and the input voltage to the base circuit is $V_B = 10\text{ V}$. If $V_{CE(\text{Sat})} = 1.0\text{ V}$ and $V_{BE(\text{Sat})} = 1.5\text{ V}$, find
 - (i) The value of R_B that results in saturation with an over drive factor of 5.
 - (ii) The forced value of β .
 - (iii) The power loss P_T in the transistor. (08 Marks)

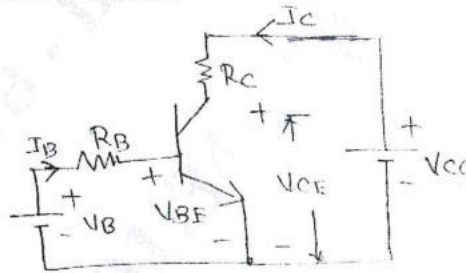


Fig. Q2 (b)

- c. Explain the output characteristics of IGBT. (04 Marks)

3.
 - a. Explain the two transistor model of SCR and also derive the expression for anode current of SCR with gate current. (08 Marks)
 - b. The latching current of Thyristor shown in Fig.Q3 (b) is 50 mA. The Duration of firing pulse is 50 μs . Will the Thyristor get fired? (04 Marks)

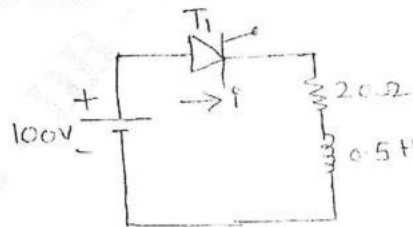


Fig. Q3 (b)

- c. Explain the various turn on methods of SCR. (08 Marks)

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- 4 a. With a neat circuit and associated waveforms explain the operation of class B self commutation. (08 Marks)
- b. Explain the operation of Resistance Capacitance (RC) fullwave trigger circuit with a neat circuit and waveforms. (06 Marks)
- c. Design a UJT relaxation oscillator for triggering an SCR. The UJT has the following parameters:
 $\eta = 0.7$, $I_p = 50 \mu\text{A}$, $V_V = 2 \text{ V}$, $I_V = 6 \text{ mA}$, $V_{BB} = 20 \text{ V}$, $R_{BB} = 7 \text{ K}\Omega$
 The leakage current with emitter open is 2 mA. The triggering frequency is 1 kHz and $V_{gt(\min)} = 0.2 \text{ V}$. Assume $C = 0.1 \mu\text{F}$. (06 Marks)
- 5 a. With a neat circuit, associated waveforms explain the operation of a single phase full converter and show that the converter can operate in two quadrants by deriving the relevant expression. Assume highly inductive load with ripple free continuous load current. (08 Marks)
- b. A single phase half-wave controlled converter is operated from 120 V, 50 Hz supply. Load resistance $R = 10 \Omega$. If average output voltage is 25% of the maximum possible average output voltage determine (i) Firing angle (ii) Average and rms values of SCR currents. (06 Marks)
- c. Explain the operation of a single phase dual converter with circulating current mode with a neat circuit diagram and waveforms. (06 Marks)
- 6 a. Compare on-off control with phase angle control as applied to AC voltage controllers. (04 Marks)
- b. A single phase unidirectional AC voltage controller has a resistive load of $R = 10 \Omega$ and the input voltage is 120 V, 50 Hz. The delay angle of the thyristor is $\alpha = \frac{\pi}{2}$. Determine
 (i) The rms value of output voltage V_0 .
 (ii) The input power factor.
 (iii) The average input current.
 (iv) The average output current. (08 Marks)
- c. With neat circuit diagram and waveforms, explain the operation of single phase bidirectional AC voltage controller for resistive load. Derive the equation for rms output voltage. (08 Marks)
- 7 a. Explain the working principle of step down chopper with resistive load. With neat circuit and associated waveforms. Derive the equation for, (i) rms output voltage (ii) Effective input resistance in terms of chopper duty cycle. (08 Marks)
- b. Classify the chopper and explain each classification in brief with circuit diagrams. (08 Marks)
- c. Explain the performance parameters of choppers. (04 Marks)

- 8 a. With a neat circuit and waveforms explain the working of Buck regulator. (10 Marks)
- b. A boost regulator shown in Fig. Q8 (b) has an input voltage of $V_s = 5$ V. The average output voltage $V_a = 15$ V and the average load current $I_a = 0.5$ A. The switching frequency is 25 kHz. If $L = 150$ μ H and $C = 220$ μ F. Determine
- The duty cycle K .
 - The ripple current of inductor ΔI .
 - The ripple voltage of filter capacitor ΔV_c .
 - The critical values of L and C .
- (10 Marks)

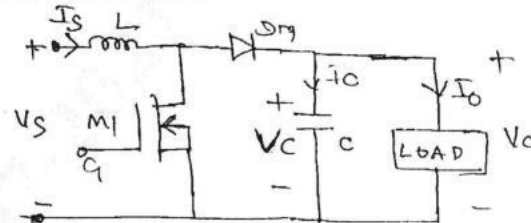


Fig. Q8 (b)

- 9 a. What do you mean by Inverter? Explain the operation of single phase half bridge inverter, with neat circuit and waveforms. (08 Marks)
- b. The single phase full bridge inverter has a resistive load of $R = 2.4$ Ω and the dc input voltage is $V_s = 48$ V. Determine
- The rms output voltage at the fundamental frequency V_{01} .
 - The output power P_0 .
 - The average and peak currents of each transistor.
 - The peak reverse blocking voltage V_{BR} of each transistor.
- (06 Marks)
- c. Explain the performance parameters of inverter. (06 Marks)
- 10 a. With a neat circuit, explain the variable DC link inverter. (06 Marks)
- b. Explain single phase AC switches. (07 Marks)
- c. Explain solid state relays. (07 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021 Cryptography

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1
 - a. Explain the working of Euclidean algorithm with a neat flow chart. (15 Marks)
 - b. Demonstrate with an example. Write the properties of Congruence's. (05 Marks)

- 2
 - a. Explain Groups, Rings and Field with axioms. (15 Marks)
 - b. Demonstrate cyclic subgroup with an example. (05 Marks)

- 3

Encrypt the plaintext "MONDAY". Using HILL cipher with the given key. Show the calculation for Encryption and Decryption (Hint : a = 0, b = 1.....z = 25)

Key : $\begin{bmatrix} 3 & 3 \\ 2 & 5 \end{bmatrix}$. Note : Show all the matrix calculation steps. (20 Marks)

- 4

Describe the working Data Encryption Standards (DES) and Feistel Cipher with neat diagram. (20 Marks)

- 5

Explain the AES Encryption process with a neat diagram. (20 Marks)

- 6
 - a. Explain stream Cipher with neat diagram. Highlight the two advantages and disadvantages over Block cipher. (10 Marks)
 - b. Describe the working of Threshold generator and Geffe Generator with necessary diagrams. (10 Marks)

- 7
 - a. Derive the proof of Euler's theorem and also determine $\phi(37)$ and $\phi(35)$. (10 Marks)
 - b. Explain what is Chinese Remainder theorem and steps involved. (10 Marks)

- 8
 - a. Demonstrate the Diffie-Hellman key Exchange with an example. (10 Marks)
 - b. Briefly explain the Elliptic curve cryptography and mention 2 applications. (10 Marks)

- 9

Explain the principle of Message Authentication Code (MAC) with a neat block diagram. Mention the limitations. (20 Marks)

- 10
 - a. Describe the working of MD4, MD5 hash functions with neat diagram. (12 Marks)
 - b. Write the DSA digital signature algorithm signature. (08 Marks)

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17EC755

Seventh Semester B.E. Degree Examination, July/August 2021 Satellite Communication

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Define :
- Trajectory (05 Marks)
 - Apogee distance
 - Inclination
 - Equinox
 - Prograde orbit. (05 Marks)
- b. State and explain three Kepler's law of planetary motion with relevant diagram and equations. (10 Marks)
- c. A satellite is moving in an elliptical orbit with the major axis equal to 42000km. If the perigee distance is 500km. Find :
- semi major axis value
 - Apogee distance
 - Eccentricity. (05 Marks)
- 2 a. What is meant by stabilization of a satellite? Explain spin stabilization and 3-axis stabilization. (08 Marks)
- b. Explain orbital effects on satellite performance. (08 Marks)
- c. Two different geostationary satellites in INSAT series are located at 70°W and 90°W . Determine the line of distance between the two satellites orbiting the earth at a height of about 36,000km above the surface of earth. Assume radius earth is equal to 6370km. (04 Marks)
- 3 a. With neat sketch explain the working of a solar cell. (06 Marks)
- b. Why are seasons needed in satellite communication system? Explain its various types. (06 Marks)
- c. Explain with relevant diagram, telemetry tracking and command system. (08 Marks)
- 4 a. Explain earth station architecture with neat block diagram. (06 Marks)
- b. List and explain the types of earth stations on the basis of service provided by them and their usage. (06 Marks)
- c. What is satellite tracking? Explain with relevant diagram, monopulse tracking and lobe switching techniques. (08 Marks)
- 5 a. Explain with neat block diagram, the TDMA frame structure. (08 Marks)
- b. Compare SCPC and MCPC systems, with neat block diagram. (06 Marks)
- c. Explain frequency hopping CDMA transmitter and receiver with suitable block diagram. (06 Marks)

- 6 a. A geostationary satellite at a distance of 36000km from the surface of the earth radiates a power of 10W in the desired direction through an antenna having a gain of 20dB. What would be the power density at a receiving site on the surface of the earth also the power received by antenna having an effective aperture of 10m^2 ? (05 Marks)
- b. Describe the important parameters that influence the design of a satellite communication link. (08 Marks)
- c. Explain Farady effect and scintillation respect to propagation considerations in satellite link design. (07 Marks)
- 7 a. What is Transponders? Explain various types of transponders. (10 Marks)
- b. Explain with neat diagram satellite point to point telephone network. (10 Marks)
- 8 a. Explain the advantage and disadvantages of satellite over terrestrial network. (10 Marks)
- b. Explain with neat diagram satellite cable TV. (10 Marks)
- 9 a. Explain optical, thermal and microwave remote sensing system. (09 Marks)
- b. Explain remote sensing payloads. (06 Marks)
- c. Mention few applications of remote sensing satellite and weather forecasting satellite. (05 Marks)
- 10 a. Explain weather forecasting satellite payload. (06 Marks)
- b. Explain working principle of Global positioning systems. (08 Marks)
- c. Explain the signal structure of GPS system. (06 Marks)

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17TE71

Seventh Semester B.E. Degree Examination, July/August 2021 Cryptography and Network Security

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Explain the Euclid's algorithm for determining the GCD of two positive integers. Find the GCD of (1970, 1066) using Euclid's algorithm. (10 Marks)
b. Briefly explain the following with examples :
 - i) play fair
 - ii) (2×2) Hill ciphers. (10 Marks)
- 2 a. Define modular arithmetic operation with necessary properties and prove the same. (10 Marks)
b. Describe simple XOR and one time pad encryption techniques with an example and its difficulties. (10 Marks)
- 3 a. Illustrate the following with necessary diagrams :
 - i) Feistel encryption and decryption process
 - ii) Single DES encryption. (12 Marks)
b. Explain the process of AES encryption with necessary diagram. (08 Marks)
- 4 a. Briefly explain RSA algorithm with example. (06 Marks)
b. Illustrate the diffie – Hellman key exchange algorithm with example. (06 Marks)
c. With the help of neat diagram, explain elliptic curve Arithmetic and Rules. (08 Marks)
- 5 a. Differentiate between MD4 and MD5 algorithm. (06 Marks)
b. Outline N-Hash algorithm with neat diagram. (06 Marks)
c. Explain discrete logarithmic signature scheme. (08 Marks)
- 6 a. With the neat diagram, explain the operation of Secure Hash Algorithm (SHA). (08 Marks)
b. Explain DSA algorithm with necessary diagram and required example. (12 Marks)
- 7 a. With necessary diagram, explain the SSH protocol stack layers. (07 Marks)
b. Explain SSL protocol stack with session state and connection status parameters. (07 Marks)
c. With neat flow diagram, explain IEEE802.11i phases of operation. (06 Marks)

- 8 a. Explain SSH transport layer protocol packets exchange and packet formation with required diagram. (08 Marks)
b. Explain all the services and protocols of IEEE 802.11 i WLAN with necessary diagram. (12 Marks)
- 9 a. Explain PGP cryptographic functions with relevant diagram. (10 Marks)
b. Explain the concept of combining security associations internet key exchange with necessary diagrams. (10 Marks)
- 10 a. Describe the cryptographic algorithm used in S/MIME. (08 Marks)
b. With relevant diagram, explain all the fields involved in ESP packet. (06 Marks)
c. With neat diagram, explain typical scenario of IP security with its applications. (06 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021 CMOS VLSI Design

Time: 3 hrs.

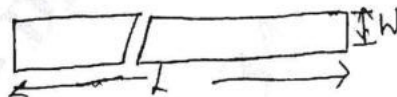
Max. Marks: 100

Note: Answer any FIVE full questions.

1.
 - a. Explain the DC transfer characteristics of complementary CMOS inverter and highlight the regions of operations of MOS transistors. (10 Marks)
 - b. Explain nMOS fabrication process with neat diagram. (10 Marks)

2.
 - a. Explain the following:
 - i) Channel length modulation (10 Marks)
 - ii) Subthreshold conduction. (05 Marks)
 - b. Compare CMOS and Bipolar technologies. (05 Marks)
 - c. Explain the operation of CMOS tristate inverter with neat diagram. (05 Marks)

3.
 - a. Draw circuit, stick and layout diagram for nMOS shift register cell. (08 Marks)
 - b. Explain ' λ ' based design rules for contact cuts and vias with neat diagram. (08 Marks)
 - c. Define sheet resistance ' R_s ' and standard unit of capacitance C_g . Estimate the value of capacitance in $\square C_g$ for the given metal layer shown in Fig.Q.3(c), if features size is $2\lambda \times 2\lambda$ and relative value of metal to substrate = 0.075. (04 Marks)



$$L = 20\lambda$$

$$W = 3\lambda$$

Fig.Q.3(c)

4.
 - a. Draw the stick diagram for 4:1 nMOS inverter. (06 Marks)
 - b. Interpret Rise time and Fall time for CMOS Inverter. (06 Marks)
 - c. Explain Inverting and Non-Inverting super buffer. (08 Marks)

5.
 - a. Determine the scaling factors the following:
 - i) Gate area ' A_g ' and Gate capacitance ' C_g '
 - ii) Carrier density in channel ' Q_{on} '
 - iii) Saturation current ' I_{dss} '
 - iv) Maximum operating frequency ' f_o '
 - v) Power dissipation per gate ' P_g '. (10 Marks)
 - b. Explain 4×4 barrel shifter with neat diagram. (10 Marks)

6.
 - a. Explain 4 bit data path for the processor with neat diagram. (06 Marks)
 - b. Develop 4 bit ALU to implement addition, subtraction, XOR, XNOR, AND and or function. (08 Marks)
 - c. Explain Manchester carry chain. (06 Marks)

- 7 a. Explain the architectural issues related to VLSI subsystem design. (06 Marks)
b. Explain in detail the generic structure of an FPGA. (08 Marks)
c. Explain switch logic of 4-way multiplexer for nMOS switches. (06 Marks)
- 8 a. Explain the following:
i) Pseudo-nMOS logic
ii) Dynamic CMOS logic (10 Marks)
b. Summarize goals and techniques of FPGA. (10 Marks)
- 9 a. What are timing considerations in system design? (06 Marks)
b. Explain Observability and Controllability in testing. (06 Marks)
c. Explain 3-transistor Dynamic RAM cell with neat diagram. (08 Marks)
- 10 a. Explain nMOS pseudo-static RAM cell with schematic diagram. (10 Marks)
b. Explain the following: i) BIST ii) Adhoc Testing. (10 Marks)

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