6E7151

Roll No. _____ [Total No. of Pages : 2

6E7151

B.Tech. VI -Sem. (Main) Examination, July - 2023
Electronics and Communication Engg.
6EC3-01 Power Electronics
EC,EI

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory **(10×2=20)**

1. Give industrial application of GTO.
2. Explain the importance of Turn on mechanism of a power semiconductor device.
3. Describe the basic difference between single and three phase bridge convertor.
4. What information can be extracted from V-I characteristics?
5. What is basic difference between a converter and an inverters?
6. Explain role of power semiconductor device in industrial power supplies.
7. Give engineering application of uninterruptible power supply.
8. Give difference between voltage and frequency control motor control methods.
9. Explain how power semiconductor device are important in speed controlling of electrical motors.
10. Give advantage of single phase half wave bride converter over other converters.

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

1. Give scope and outcome of the course (Power Electronics).
2. Explain the working module of Power diodes.
3. Describe the working mechanism of single phase full bridge converter.
4. Give difference between Voltage and Current Source Inverter.
5. By help of neat diagram explain the Uninterruptible Power Supply.
6. Describe the speed control of DC motors using phase controlled converters and choppers.
7. Explain the Switch Mode Power Supply give its application.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Three questions. **(3×10=30)**

1. Explain the construction and working of a MOSFET also explain how this is different from IGBT and GTO.
2. By help of neat diagram explain PWM Control of Voltage Source Converter and applications.
3. Explain Principle of operation of choppers also explain Step up, Step down and reversible choppers.
4. By help of neat diagram design a 3 phase bridge converter explain its working and give its application and challenges.
5. Give basic idea of speed control of three phase induction motors using voltage and frequency control methods.

6E1591

Roll No. _____ [Total No. of Pages : 2

6E1591

B.Tech. VI-Sem. (Back) Examination July - 2023
Electronics and Comm. Engineering
6EC 3-01 Power Electronics
EC,EI

Time : 2 Hours **Maximum Marks : 80**
Min. Passing Marks : 28

Instructions to Candidates:

*Attempt **all Five** questions from **Part A**, **four** questions out of **Six** questions from **Part B** and **two** questions out of **three** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are **compulsory** **(5×2=10)**

1. Define Latching and Holding Current of SCR.
2. Explain the principle of operation of Choppers.
3. Differentiate between power transistor and bipolar junction transistor.
4. What do you mean by commutation of SCR?
5. An SCR has half cycle surge current rating of 3000A for 50Hz supply. Calculate its one cycle surge rating and I^2t rating.

PART - B

(Analytical/Problem solving questions)

Attempt any **Four** questions **(4×10=40)**

1. a) Explain the Pulse width modulation control technique.
   b) Input to the step up chopper is 200 V. The output required is 600V. If the conducting time of thyristor is 200 μ sec.Compute
      i) Chopping frequency
      ii) If the pulse width is halved for constant frequency of operation, find the new output voltage

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2. Discuss about the voltage source inverters and explain with help of diagrams.
3. Draw the switching characteristics of SCR during turn on and turn off times. Explain the turn on and turn off mechanism along with the switching characteristics.
4. Explain the working principles of single phase full wave bridge converter with all relevant diagrams and waveforms.
5. Explain the uninterruptible power supply with their suitable diagrams.
6. a) Explain the operation of step-up chopper. Derive the expression for its output voltage and draw corresponding waveforms.

   b) A buck boost converter is operated from a 24V battery an supplies and average load current of 2 A. Its switching frequency is 50 kHz. Neglecting diode and switch drop, determine:

   i) The peak to peak choke ripple current for the nominal supply voltage given that the choke value is 500 MH

   ii) Range of duty variation required to maintain the output voltage ranges from 26V in the fully charged state of 21 V in discharged state.

Part - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Two** questions **(2×15=30)**

1. Explain the basic idea of speed control of three phase induction motors using voltage and frequency control methods.
2. Define SMPS. Explain and drive the output voltage of Flyback SMPS Converter with relevant diagrams and waveforms.
3. a) Explain the working of SCR on the basis of two transistor analogy.

   b) The latching current for an SCR inserted in between a DC voltage source of 200 V and the load is 100mA. Compute the minimum width of 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 $L = 2H$

   c) Explain the method adopted for the protection of SCRs with over currents.

6E7152

Roll No. _____ [Total No. of Pages : 2

6E7152

B.Tech. VI sem. (Main) Examination, July - 2023
Electronics and Communication Engg.
6EC 4-02 Computer Network

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, **five** questions out of **Seven** questions from **Part B** and **Three** questions out of **Five** questions from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. What do you understand by birth and death process in a queuing system?
2. Differentiate Adaptive and Non-adaptive routing algorithm.
3. Discuss the types of multiplexing briefly.
4. Write the names of seven OSI layers in an orderly fashion.
5. What do you understand by connection-less network?
6. Discuss briefly about multicast routing.
7. State the utility of medium access control protocols.
8. Differentiate local and wide area networks.
9. What is the use of congestion control algorithms?
10. What do you mean by DNS?

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

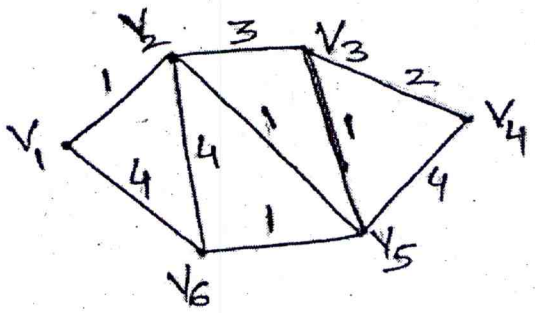
1. Draw protocol header of IPv4 protocol. Discuss header details of this protocol.
2. Differentiate Bit stuffing and Byte stuffing. Perform bit stuffing procedure for the binary sequence 11011111111011111111101010011.
3. Draw the TCP header and discuss its header details.
4. Discuss about different classes of IP addresses by showing their respective 32 bits address sub-division for net ID and host ID.
5. Draw the frame format and discuss the IEEE 802.3 protocol.
6. Discuss briefly about (i) SDN (ii) HTTP
7. Discuss about different quality of service parameters in a computer network.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Three questions. **(3×10=30)**

1. Write briefly about following network connection devices and their specific use:
   i) Hubs ii) Bridges iii) Switches iv) Routers.
2. Draw a diagram of a network in which four subnets are connected with each other through a network router. Each subnet contains four hosts which are connected to the router through a hub or switch. Four subnet ID's are represented as 170.20.62.X, 170.20.214.X, 170.20.196.X and 170.20.188.X. Discuss the flow of data from a host of one subnet to the host of another subnet.
3. Apply Dijkstra's routing algorithm for the graph as shown below and find the shortest routing path for the vertex V_1 to all the other vertices. Show your result by drawing a routing table. Weights between the two adjacent vertices are same in both the directions.



4. Draw the flow diagram of leaky bucket algorithm and discuss its congestion control mechanism.
5. Draw the diagram representing **M/M/1** queuing system. Write the flow balance relation for first three nodes and calculate the probability of having zero packets in the system.

6E1592

Roll No. _____ [Total No. of Pages : 2

6E1592

B.Tech. VI - Sem. (Back) Examination, July- 2023
PCC/PEC Electronics and Communication Engineering
6EC 4-02 : Computer Network

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

*Attempt all **Ten** questions from **Part A**, **Five** questions out of **Seven** from **Part B** and **Four** questions out of **Five** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Define Queuing Theory.
2. Differentiate between client server and peer to peer.
3. Define WWW.
4. What is IP address?
5. What are the duties of the transport layer?
6. What is meant by quality of service?
7. Define Routers.
8. What is a virtual circuit?
9. Define a standard 802.3.
10. What is the purpose of ALOHA protocol?

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PART - B
(Analytical/Problem solving questions)

Attempt any Five questions. **(5×8=40)**

1. Explain Little's formula with the help of appropriate example.
2. Explain the difference between IPV_4 and IPV_6.
3. Derive and Explain the Mathematical model for M/M/1/K Queue.
4. Explain file transfer protocol (FTP) in details.
5. Discuss Blocking in packet switches and Three generations of packet switches with suitable diagram.
6. Compare and contrast the features of TCP and UDP in details.
7. Explain in brief the concept of DNS poisoning. How we overcome from this problem?

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Four questions. **(4×15=60)**

1. The capacity of communication line is 2000 bit/second. This line is used to transmit eight bit characters, so the maximum rate is 250 characters/second. The application calls for traffic from many devices to be sent on the line with a total volume of 12,000 characters/minute. Determine:
   i) Line utilization
   ii) The average no of characters waiting to be transmitted.

2. a) Show that slotted ALOHA has a maximum throughput of twice the maximum throughput of pure ALOHA.
   b) Briefly describe various CSMA protocols.

3. Write short notes on
   a) Multicast routing
   b) Congestion Avoidance Mechanisms

4. What is the difference between adaptive and non adaptive algorithm? Explain each algorithm briefly?

5. Answer the following questions.
   i) Differentiate between token bucket and leaky bucket algorithm.
   ii) Token Ring and Token bus.

6E7153

Roll No. _____ [Total No. of Pages : 2

6E7153

B.Tech. VI Sem. (Main) Examination, July - 2023
Electronics and Communications Engineering
6EC4-03 Fiber Optics Communications

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Explain the block diagram of optical fiber communication.
2. List the uses of devices based on optical fiber technique in daily life.
3. Describe the phase and group velocity in OFC.
4. Which profiles is preferred in the graded index profile.
5. Differentiate between single and multimode fibers.
6. What is the need of optical amplifier?
7. Importance of optical switching in optical fiber communication.
8. Explain different types of misalignment occur in optical fiber jointing.
9. List the different types of the noise encounter in optical detectors.
10. Why optical power budgeting required in FOC.

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

1. Evaluate the advantage, disadvantages and applications of optical fiber communication with proper explanation.

2. What is Dispersion? Explain and compare the dispersion shifted cable and dispersion flattened cable with neat diagram?
3. A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine:
   a) Critical angle at core cladding interface.
   b) The NA for the fiber.
   c) The acceptance angle in air for the fiber.
4. Describe the common LED structure for optical fiber communication; also give their merits and demerits.
5. Why optical amplifiers required in optical fiber communication? Explain fiber Raman amplifier with neat diagram.
6. Distinguish between WDM and DWDM. What is the base frequency and channel spacing specified by ITU for DWDM?
7. A trigonometric measurement is performed in order to determine the numerical aperture of a step index fiber. The screen is positioned 10 cm from the fiber end face. When illuminated from a wide angled visible source the measured output pattern size is 6.2 cm. Calculate numerical aperture of fiber.

PART - C

(Descriptive/Analytical/Problem solving/Design questions))

Attempt any three questions. **(3×10=30)**

1. A 80/125 μm graded index fiber with a NA of 0.25 and profile parameter α of 2.0 is jointed with a 60/125 μm fiber with an NA of 0.21 and profile parameter α of 1.9. The fiber axes are perfectly aligned and there is no air gap. Calculate the insertion loss at a joint for the signal transmission in the forward and backward directions.
2. What are the differences between splices and connectors? Explain different types of splices and connectors use in optical fiber communication with neat diagram.
3. Photons of wavelength 0.90 μm are incident on p-n photodiode at a rate of 5×10^{10} s^{-1} and on an average, the electrons are collected at the terminals of the diode at the rate of 2×10^{10} s^{-1}. Calculate;
   i) The quantum efficiency.
   ii) The responsivity of the photo diode at this wavelength.
4. What is the need of Optical Time domain Reflectometry (OTDR) in optical fiber communication? Explain the process of fault location identification with neat graph and diagram.
5. Why should we study non-linear fiber optics? Explain the kerr non-linearity and other non-linearity in detials for optical communication.

6E1593

Roll No. _____ [Total No. of Pages : 2

6E1593

B.Tech. VI-Sem. (Back) Examination July - 2023
Electronics & Comm. Engg.
6EC 4-03 Fiber Optics Communications

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, **five** questions out of **Seven** from **Part B** and **Four** questions out of **Five** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory **(10×2=20)**

1. Define Step index and Graded index fiber.
2. Name the important reasons of signal degradation.
3. Define the quantum efficiency and responsivity of a p-n diode?
4. What is bending loss?
5. Name three working principles of laser.
6. A digital fiber link operating at 850 nm requires a maximum BER of 10^{-9}. Find the quantum limit in terms of the quantum efficiency.
7. For a step index fiber, core refractive index (n_1) = 1.45 and Δ = 0.01. Calculate the Numerical aperture and clad refractive index (n_2).
8. State Snell's law condition for TIR Phenomenon.
9. What is the purpose of using optical switches in communication link?
10. Write down the name of Non - linear effect of Optical fiber link.

PART - B

(Analytical/Problem solving questions)

Attempt any five questions **(5×8=40)**

1. Explain the working principle of Optical Time Domain Reflectometer (OTDR).
2. Explain the working of He - Ne Laser with suitable diagram.
3. Suppose an N*N star coupler is constructed of n 3-dB 2*2 couplers, each of which has a 0.1 dB excess loss. Find the maximum value of n and the maximum size N if the power budget for the star coupler is 30 dB.
4. Drive the electric field equations for homogeneous and inhomogeneous medium.
5. Explain the concept of self - phase modulation and group velocity.
6. What is attenuation? Explain the different optical fiber attenuation techniques.
7. A 15 km optical fiber link uses fiber with a loss of 1.5 dB/km. The fiber is joined every at every two kilometers with connectors which give an attenuation of 0.7 dB each. If the coupler is used at both ends of the fiber with attenuation of 0.2 dB each. Calculate the minimum mean optical power (in dBm) which must be launched into the fiber in order to maintain a mean optical power level of 0.6 μ w.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Four questions **(4×15=60)**

1. Explain the working principle of EDF amplifier with suitable diagram. How it is different from Raman Amplifier?
2. Draw the experimental set up of fiber attenuation measurement and explain the uses of each setup block.
3. What is the need of WDM Modulation in Optical fiber. Explain CWDM and DWDM modulation technique in details.
4. Derive the relation for model analysis of wave propagation in step index fiber (cylindrical coordinate).
5. Explain the SLED and ELED structure with suitable diagram. Which LED is better for Optical communication and why?

6E7154

Roll No. _____ [Total No. of Pages : 2

6E7154

B.Tech. VI sem. (Main) Examination, July - 2023
Electronics and Communication Engg.
6EC4-04 Antennas and Propagation

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, five Questions out of seven questions from Part B and three questions out of five questions from Part C .

Schematic diagram must be shown wherever necessary. Any data you feel missing suitably be assumed and states clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

PART - A

(Answer should be given up to 25 words only)

All question are compulsory. **(10×2=20)**

1. Write down the reciprocity property of antenna.
2. Define directivity and gain of antenna.
3. Draw the feed system for parabolic reflector.
4. Draw the structure of pyramidal horns.
5. Define maximum usable frequency.
6. Write the name of frequency independent antennas.
7. Draw the structure of circular patch antenna with probe feed.
8. Draw the radiation pattern of yagi-uda antenna.
9. Write down the name of different modes of radio wave propagation.
10. What is array factor?

PART - B

(Analytical/Problem solving questions) **(5×4=20)**

Attempt any five questions:

1. Derive the expression for radiated power of half - wave dipole.
2. What is the effective aperture of antenna and how is it related to gain?

3. The radiation resistance of a thin, lossless linear electric dipole of length $l = 0.5\lambda$ is 100 ohms. What is the input resistance?
4. Describe the Babinet's principle for aperture antenna.
5. Explain the feeding methods for microstrip antennas.
6. What are the major advantages and disadvantages of a patch antenna?
7. Write down the concept and benefits of smart antenna.

PART - C

(Descriptive/Analytical/Problem solving/Design Questions))

Attempt any three questions. **(3×10=30)**

1. a) Distinguish between end-fire and broadside arrays.
   b) Given a linear , broadside, uniform array of 10 isotropic elements. ($N = 10$) with a separation of $\lambda/4$ $\left(d = \lambda/4\right)$ between the elements, find the directivity of the array.
2. Design a rectangular microstrip antenna with dimensions W and L , over a single substrate, whose center frequency is 10 GHz. The dielectric constant of substrate is 10.2 and the height of the substrate is 0.127 cm. Determine the physical dimensions W and L (in cm) of patch, taking into account field fringing. Draw the layout of antenna also.
3. An E-plane horn is fed by an X-band WR 90 rectangular waveguide with inner dimensions of 0.9 in (2.286 cm) and b= 0.4 in (1.016 cm). Design the horn so that its maximum directivity at f = 11 GHz is 30 (14.77 dB)
4. Design a five - turn helical antenna which at 400 MHz operates in the normal mode. The spacing between turn is $\lambda/50$. It is desired that the antenna posserses circular polarization Determine the
   a) Circumference of the helix
   b) Length of a single turn.
   c) Overall length of the entire helix.
   d) Pitch angle.
5. Write short note on following
   a) Adaptive bean forming.
   b) Dipoles for mobile communication.
   c) Broad cast antennas.
   d) Planar arrays.

6E1594

Roll No. _____ [Total No. of Pages : 3

6E1594

B.Tech. VI - Sem (Back) Examination July - 2023
Electronics & Comm. Engg.
6EC 4-04 Antennas and Propagation

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all Ten** questions from **Part A**, **five** questions out of **Seven** questions from **Part B** and **Four** questions out of **Five** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory **(10×2=20)**

1. What do you mean by the polarization and define its type.
2. Briefly explains the importance of "Efficiency" and "Gain" of Antennas.
3. Explain Tropospheric scattering.
4. Find out the radiation resistance of a $\frac{\lambda}{20}$ wire dipole in free space.
5. State Babinet's Principle?
6. Write the difference between End fire array and Broadside Array.
7. Draw the labeled diagram of E-plane sectoral horn and H-plane sectoral horn.
8. What is smart antenna? Write its application.
9. An antenna has a loss resistance 15 Ω, power gain of 13.01 dB and directivity 14 dB. Calculate its radiation Resistance.
10. Explain the feeding techniques for microstrip patch antenna?

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions **(5×8=40)**

1. Derive FRISS free space equation. Also explain ground wave and sky wave propagation.

2. Define the effective aperture and directivity. Calculate the Maximum effective aperture of a microwave antenna which has a directivity of 38.2 dB.

3. Explain different mechanism of wave propagation.

4. Explain in detail with neat and clean diagram the construction and working of Horn Antenna.

5. Design a rectangular microstrip patch antenna using a substrate with dielectric constant of 2.2, h=0.1588 cm so as to resonate at 10 GHz.

6. Explain the substrate thickness and amp; dielectric constant on the performance of Microstrip Antenna.

7. Design a rectangular pyramidal horn antenna to be operated at 11 GHz frequency with required gain of 22.6 dB, if dimensions of the connecting waveguide are

   a = 2.286 cm and b = 1.016 cm.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Four questions **(4×15=60)**

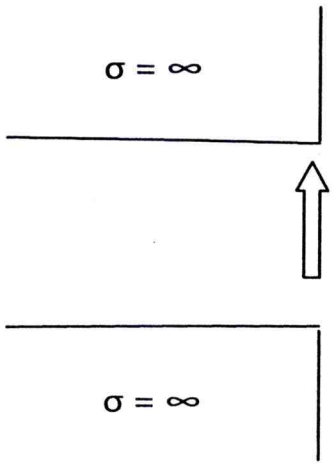
1. Derive an expression for the fields of an infinitesimal dipole carrying current to I_0 and which is located at the origin along Z axis of the coordinator system.

2. What is the need of auxiliary potential function also explain in detail the methodology to analyze field equation.

3. Determine the (a) direction of maximum radiation, (b) directivity, (c) beam solid angle, and (d) half power beam width in the x-z plane for an antenna whose normalized radiation intensity is given by

$$F(\theta,\phi)=\begin{cases}1 & \text{for } 0\le\theta\le 60^{o} \text{ and } 0\le\phi\le 2\pi \\ 0 & \text{elsewhere}\end{cases}.$$

4. A waveguide aperture is mounted on an infinite ground plane, as shown in figure. Assuming that the tangential component of the electric field over the aperture are known, are given by E a, find an equivalent problem that will yield the same fields E and H radiated by the aperture to the right side of the interface.



5. What is Schelkun off polynomial method? Explain array design with an example.

6E6054

Total No. of Questions: Total No.of Pages:

Roll No. _____

B.Tech. VI-Sem (Back) Exam 2023
Electronics & Communication Engg.
6EC4ADigital Communication
6E6054

Time: 3Hours **Maximum Marks: 80**
Min Passing Marks: 26

Attempt any **fivequestions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of the following supporting material is permitted during the examination. (Mentioned in form No.205)

1_____ 2. _____

UNIT -I

Q. 1 (a) Explain the process of quantization and obtain an expression for a signal to Quantization ratio in the case of a uniform quantizer.(b) Explain (i) Natural Sampling and Flat-top Sampling (ii) Sample and Hold circuit. (16)

OR

Q.1With neat diagrams, explain Pulse Code Modulation and demodulation system. Compare DM and ADM. (16)

UNIT -II

Q. 2 List and explain the properties of line codes. Explain how ISI occurs in a base-band binary data transmission system. (16)

OR

Q.2 (a) Explain the pulse shaping method to minimize ISI. (b)Briefly discuss (i) Eye pattern. (ii) Line codes (16)

UNIT -III

Q. 3 Explain the generation and detection of binary PSK. Also, derive the probability of error for PSK. Compare the error probability for BPSK and QPSK. (16)

OR

Q.3 Describe with diagrams the generation and detection of coherent BFSK. Explain the probability of error for this scheme. Differentiate coherent and non-coherent detection. 16

UNIT -IV

Q. 4 What is entropy and give its mathematical equation. A source emits one of four symbols S1, S2, S3, and S4 with probabilities {1/3, 1/6, 1/4, 1/4}. Calculate entropy, average codeword length, and coding efficiency using Huffman coding. (16)

OR

Q.4 List out the properties of mutual information. Write Shannon's first theorem on Source Coding and deduce the equations for an average number of bits, coding efficiency, and redundancy. (16)

UNIT -V

Q. 5 Write a short note on any two (a)(n, k) block codes(b) Syndrome decoding.(c) convolution codes (16)

OR

Q.5(a) Find a generator polynomial for a (7, 4) cyclic code and hence find the code word for [1 1 0 0]. (b) Construct the encoder for (7, 4) cyclic codes. (16)

6E7155

Roll No. _____ [Total No. of Pages : 2

6E7155

B.Tech. VI - Sem. (Main) Examination, July - 2023
Electronics and Communication Engg.
6EC4-05 Information Theory and Coding

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, Attempt any five questions out of seven questions from Part B and three questions out of five questions from Part C .

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A
(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. What is entropy and give its mathematical equation.
2. Describe the information rate.
3. List out the properties of mutual information.
4. Define Shannon's law.
5. Outline the concept of a discrete memoryless source.
6. Define the terms coding efficiency and redundancy.
7. Define source coding. State the significance of source coding.
8. List out the advantages and Disadvantages of cyclic codes.
9. What is meant by constraint length and free distance of a convolution code?
10. Calculate the amount of information if $pk = 1/4$.

PART - B
(Analytical/Problem solving questions)

Attempt any five questions. **(5×4=20)**

1. a) Define mutual information I (X;Y) and show that I $(X;Y) \geq 0$.
   b) Derive the relationship between entropy and mutual information.

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2. Explain briefly the syndrome calculation circuit for (n,k) cyclic code.
3. Give the relation between channel capacity C, bandwidth W and signal-to-noise ratio S/N of an AWGN channel. Explain the trade - off between them.
4. Define generator and parity check matrices of a (7,4) linear block code. Explain how to generate a linear block code using G-matrix. Explain with an example.
5. From the channel capacity theorem, find the capacity of a channel with infinite bandwidth and explain.
6. Briefly describe the steps of viterbi algorithm.
7. Consider a (6,3) linear block code whose generator matrix is given by

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

i) Find the parity check matrix.

ii) Find the minimum distance of the code.

PART - C

(Descriptive/Analytical/Problem solving)

Attempt any three questions. **(3×10=30)**

1. Construct a symmetric (7,4) cyclic code using the generator polynomial $g(x)=x^3+x+1$.

   What are the error - correcting capabilities of this code? For the received word 1101100, determine the transmitted code word.

2. Write a short note on any two

   i) Markov sources

   ii) Linear block codes

   iii) Cyclic codes.

3. Given $Xi=\{x_1,x_2,x_3,x_4,x_5,x_6\}$ with probabilities $p(xi)=\{0.3,0.25,0.2,0.12,0.08,0.05\}$

   Make Huffman code. Find the efficiency of this code.

4. Consider (3,1,2) convolutional code with $g(1)=(110)$, $g(2)=(101)$ *and* $g(3)=(111)$:

   i) Draw the encoder block diagram

   ii) Find the generator matrix.

5. a) Prove that the entropy for a discrete source is maximum when the output symbols are equally probable.

   b) Find the discrete entropy for the source with symbol probabilities $\{0.3,0.25,0.2,0.15,0.1\}$.

6E1595

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6E1595

B.Tech. VI-Sem. (Back) Examination, July - 2023
Electronics and Comm. Engineering
6EC 4-05 Information theory and Coding

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, **five** questions out of **Seven** from **Part B** and **Four** questions out of **Five** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Define entropy and coding efficiency.
2. Define shannon channel capacity theorem.
3. What is the hamming distance?
4. Define the physical significance of entropy.
5. An Information A,B,C and D is transmitted with the probability is ½, 1/4, 1/8 and 1/8. Find entropy.
6. Distinguish source coding from channel coding and its requirement.
7. What is the significance of a syndrome vector in the context of error control coding?
8. What are the advantages and disadvantages of convolutional codes?
9. How do we use Parity Matrix in Block coding.
10. Define G and H matrix and show that $G.H^T = 0$.

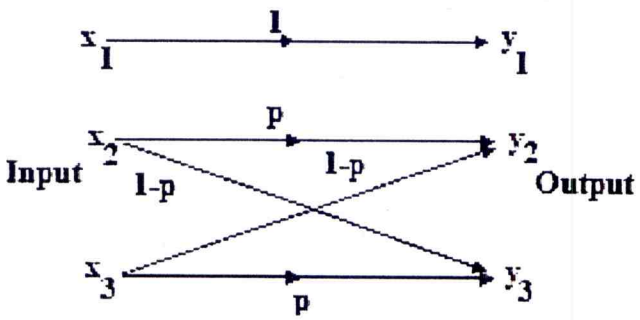
PART - B

(Analytical/Problem solving questions)

Attempt any five questions. **(5×8=40)**

1. Consider (3,1,2) convolutional code with g(1) = (110), g(2) = (101) and g(3) = (111) :
   i. Draw the encoder block diagram.
   ii. Find the generator matrix.
   iii. Find the code word corresponding to the information sequence (11101) using the time domain approach.

2. For Ternary channel $P_X(x_1) = P$, $P_X(x_2) = P_X(x_3) = Q$ where P+2Q = 1. Find channel capacity and I (x;y).



3. Show that I (X:Y) = H (X) + H(Y) - H(X,Y).
4. Define channel capacity theorem. Showing that channel capacity is dependent on Bandwidth and SNR also defines the tradeoff between bandwidth and SNR.
5. What is entropy? Explain Joint entropy and conditional entropy. Write down the properties of entropy.
6. Construct the Huffman code with minimum code variance for the following probabilties and also determine the code variance and code efficiency {1/4, 1/4, 1/8, 1/8, 1/8, 1/16, 1/16}.
7. The parity check bits of a (8,4) block code is given by :

$$C_1 = m_1 + m_2 + m_4$$
$$C_2 = m_1 + m_2 + m_3$$
$$C_3 = m_1 + m_3 + m_4$$
$$C_4 = m_2 + m_3 + m_4$$

Here m_1, m_2, m_3, m_4 are message bits.

a. Find the generator matrix and parity check matrix for this code.

b. Find the minimum weight of this code.

c. Find error detecting capabilities of this code.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Four questions **(4×15=60)**

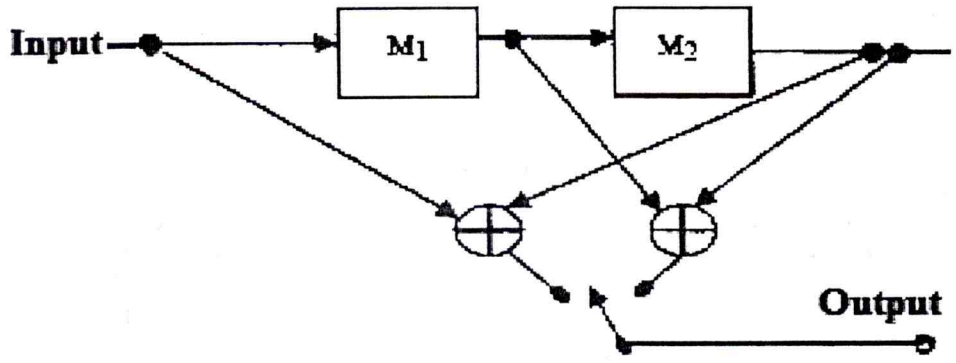
1. Consider a (6,3) linear block code whose generator matrix is given by

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

   i. Find the parity check matrix.
   ii. Find the minimum distance of the code.
   iii. Draw the encoder and syndrome computation circuit.

2. A (7,4) cyclic code has a generator polynomial : $g(X) = X^3 + X + 1$.
   i. Draw the block diagram of encoder and syndrome calculator.
   ii. Find generator and parity check matrices in systematic form.

3. Draw Trellis diagram for convolutional coder (Blocks having usual meaning) as shown in the diagram shown. Trace the path for received bits are 10 00 10 00 00 and point out discrepancies.



4. The generators matrix of a linear block code is given as

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

   i. Calculate the parity check matrix for the code.
   ii. Construct syndrome matrix.
   iii. Check that the minimum distance of the code is one or two.

5. Explain Viterbi decoding with suitable examples. Also explain the application of Viterbi decoding.

6E7156

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6E7156

B.Tech. VI-Sem. (Main) Examination, July - 2023
Electronics and Communication Engineering
6EC5-11 Introduction to MEMS (El.-II)

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, five Questions out of seven questions from Part B and three questions out of five questions from Part C .

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

PART - A
(Answer should be given up to 25 words only)

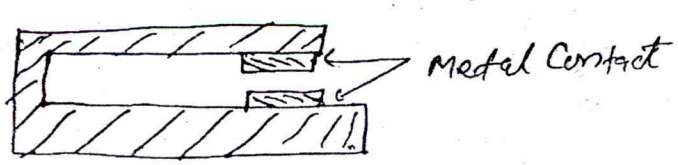
All questions are compulsory. **(10×2=20)**

1. Write the name of two nano sensor.
2. Write the steps followed in wafer bonding.
3. Write the full form of LIGA.
4. Define Anisotropic etching.
5. Write two differences between UV and X-ray lithography?
6. Write two differences between MEMS and NEMS.
7. Give two example of Actuators.
8. Write the unit of Strain?
9. Write the name of material used for sacrificial layer?
10. Write the alternate of etching.

PART - B
(Analytical/Problem solving questions)

Attempt any five questions. **(5×4=20)**

1. Compare the surface micromachining with bulk micromachining.
2. What are the functional differences between NEMS and MEMS?
3. Explain all the steps followed in achieving following MEMS structure.



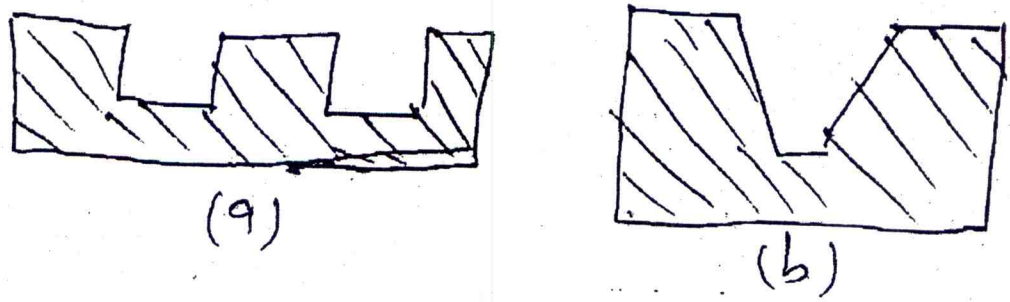
4. Write all fabrication steps followed in a MEMS device.
5. Explain
   i) Poission effect and
   ii) Finite element method.
6. Why the surface to volume ratio increased (in %) in a nanostructure? Find its change when a big cube of 100 micrometer side divided in smaller cubes of 1 micrometer side each.
7. Explain the working of In X-Rey Lithography and also find the order of resolution when its wavelength is 10 A^0.

PART - C

(Descriptive/Analytical/Problem solving/Design Questions))

Attempt any three questions. **(3×10=30)**

1. Explain the different energy methods in MEMS.
2. How following trench is fabricated in MEMS structure? Discuss the suitable etching technique applicable for it. Also calculate the anisotropic ratio in both cases.



3. Explain the working of
   i) Thermal actuator and
   ii) Piezoelectric actuator. Also compare their performances and working voltage.
4. Explain the CVD and PECVD for layer deposition? Also compare these two methods in respect of cost and quality.
5. Calculate the deflection in a cantilever beam of length L = 100 μm, width W = 20 μm and thickness $t = 10\ \mu m$. Assume the young modulus constant is E = 60GPa. Also find its effective spring constant.

6E1596

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6E1596

B.Tech. VI - Sem. (Back) Examination, July- 2023
Electronics and Comm. Engineering
6EC 5-11 Introduction to MEMS

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, **five** questions out of **Seven** from **Part B** and **Four** questions out of **Five** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are **compulsory** **(10×2=20)**

1. Explain the difference between MEMS and Microsystems.
2. Explain the process of doping of semiconductor.
3. Explain static bending of thin plates.
4. Why silicon is used as a substrate material?
5. Explain the comparison between micro electronics and microsystems technologies.
6. State the working principle for Micro actuators.
7. List the major steps involved in LIGA process.
8. Distinguish between Top-down and Bottom-up processes of nano materials synthesis.
9. State any two techniques for the characterization of materials.
10. Bring out the Significance of X-ray photo electron spectroscopy in characaterization of nano materials.

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PART - B

(Analytical/Problem solving questions)

Attempt any **Five** questions. **(5×8=40)**

1. Discuss selection of material based on application and explain "Silicon use as ideal substrate material in MEMS".
2. State various deposition techniques. Explain in brief the technique of PVD for MEMS device fabrication. Also define step coverage and shadowing.
3. Discuss briefly on actuation using thermal forces and piezoelectric crystals using a suitable sketches.
4. Explain the working principle of plasma etching and deep reactive ion etching using suitable sketches.
5. List type of Lithography Explain in detail X-ray Lithography with its major features.
6. State two advantages of LIGA process over other micro machining techniques. Explain with block diagram the steps in LIGA process. State atleast one commonly used chemical in each of the steps.
7. A Silicon substrate is doped with bar on ions at 100 KeV. Assume the maximum concentration after the doping in 30×10^{18}/cm, Find (a) the dose, θ, b) the dopant concentration at the depth 0.15 μm. (c) the depth at which the dopant concentration is at 0.1% of the maximum value. (Given R_p = 307 nm,=30×10^{-1}cm and $\Delta R_p = 69 \times 10^{-1} cm$ at 100 KeV energy level)

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Four** questions. **(4×15=60)**

1. a) Explain with figures the steps in surface micro machining. Discuss the various fabrication challenges associated with surface micromachining. [10]
   b) Explain with figures two RF MEMS applications [5]
2. Give two examples of combination of structural sacrificial layers and enchants used in MEMS fabrication along with their applications
3. a) Explain the following bonding techniques with figures [10]
      i) Silicon-on -Insulator
      ii) Wire bonding.
   b) Explain anodic bonding with figures [5]
4. State the objectives and explain the general considerations in micro system packing.
5. Write a short note on any three .
   a) High aspect Ratio MEMS.
   b) Modeling of coupled Electromechanical system.
   c) Plasma Etching.
   d) Wafer Bonding.
