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# 6E7151

## B.Tech. VI-Sem. ( Main ) Exam. - 2024

## Electronics and Communication Engineering

## 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)*

1. ..... 2. .....

**PART-A** **[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. Differentiate between power MOSFET and IGBT.

Q.2. Explain the forward conduction mode of SCR.

Q.3. What is meant by the input power factor in a controlled rectifier?

Q.4. Explain the drawback of half-bridge inverter. Explain how this drawback can be overcome.

Q.5. Illustrate the basic principle of DC-DC buck converter.

Q.6. What is meant by a step-up chopper? State the various assumptions made.

Q.7. Explain duty cycle in step-up chopper operation.

Q.8. What is the principle of operation of Inverter?

Q.9. What is the basic difference between SCR and GTO?

Q.10. What do you mean by reversible choppers?

## PART-B

[5x4=20]

**(Analytical/Problem-solving questions)**

**Attempt any five questions**

Q.1. Justify with the relevant diagram that higher the gate current, lower is the forward break-over voltage of SCR.

Q.2. A single-phase half-wave SCR circuit feeds power to the R load. Draw waveforms for source voltage, load voltage, load current and voltage across the SCR for a given firing angle. Derive an expression for average and RMS load voltages in terms of source voltage and firing angle.

Q.3. A single phase 230 volt, 1 kW heater is connected across a single phase 230 volt, 50 Hz supply through an SCR. For firing angle delays of $45^{\circ}$ and $90^{\circ}$. Calculate the power absorbed in the heater element.

Q.4. A step-up chopper has an input voltage of 220 V, and an output voltage of 660 V. If the conducting time of the thyristor chopper is 100 μs, compute the pulse width of the output voltage. In case, the output voltage pulse width is halved for constant frequency operation, find the average value of the new output voltage.

Q.5. Explain the working of Uninterruptible Power Supply with suitable diagrams.

Q.6. Explain the PWM Control of Voltage Source Converter with necessary diagram.

Q.7. Discuss the V- I characteristics of SCR with three relevant modes of it.

## PART-C [3x10=30]

**(Descriptive/Analytical/Problem-Solving/Design questions)**

**Attempt any three questions**

Q.1. A single-phase full wave-controlled rectifier circuit feeds power to the RL load. Draw waveforms for source voltage, load voltage, load current and voltage across the SCR for a given firing angle $\alpha$. Derive an expression for average and RMS load voltages in terms of source voltage and firing angle.

Q.2. For a three-phase $120^{\circ}$ mode bridge inverter feeding a star-connected resistive load. Draw the waveforms of output line voltages and obtain the Fourier series for the line voltage and RMS value of nth harmonic line voltage.

Q.3. Discuss the basic idea of speed control of three phase induction motors using voltage and frequency control methods with necessary diagrams.

Q.4. Explain the working of Flyback Converter with relevant waveforms in detail.

Q.5. Describe the working of three phase fully controlled bridge converter in the rectifying mode for firing angle of $30^{\circ}$.

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# 6E7152

## B. Tech. VI-Sem. (Main/Back) Exam. 2024

## ELECTRONICS & COMMUNICATION ENGINEERING

## 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)*

1. ..... 2. .....

**PART-A** **[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. Discuss Little's formula.

Q.2. Differentiate packet switching and circuit switching.

Q.3. Discuss briefly about the utility of HTTP Protocol.

Q.4. Write briefly about network layer's main task.

Q.5. State clearly about the use of medium access control protocols.

Q.6. State the key features of Ethernet.

Q.7. What do you understand by Resource Allocation in transport layer?

Q.8. Draw the frame format of IPv4 protocol.

Q.9. Write briefly about SDN.

Q.10. Discuss use of Fragmentation and reassembly in internet based communication.

## PART-B

[5×4=20]

**(Analytical/Problem solving questions)**

**Attempt any five questions**

Q.1. Differentiate congestion control and routing algorithms.

Q.2. Discuss HDLC Protocol by drawing its frame format and different types of 8-bit control fields associated with frames.

Q.3. Discuss fair queuing and weighted fair queuing used in ATM networks.

Q.4. Discuss any one congestion control algorithm by drawing its flow chart.

Q.5. Write briefly about the network connection devices and state their specific use.

Q.6. Draw ATM frame architecture and discuss it briefly.

Q.7. Draw the frame format of IEEE 802.5 token Ring protocol and discuss it.

## PART-C

[3×10=30]

**(Descriptive/Analytical/Problem Solving/Design question)**

**Attempt any three questions**

Q.1. Show the address aggregation of a network for multiple blocks of an organization with following scenario:

(i) Assigned ID of organization is 160.70,14.X

(ii) Organization contains four blocks

(iii) Individual blocks need 120, 37, 49 and 40 addresses

Draw the suitable diagram by using switch/router to show the internet connectivity of the organization.

Q.2. Show the transmission of packets between Tx. node A and Rx. node B in Go Back-5 sliding window protocol with the following condition :

(i) Packets from both the nodes A and B are of similar size.

(ii) Time out interval is zero second

(iii) Finitely small transmission delay between Tx. and Rx. Nodes

Show the transmission when ACK of packet no. 2 is lost and packet no. 5 received with error.

Q.3. In an M/M/m queuing system, derive the expression to calculate the average no. of packets in the queue and average waiting time of a packet in the system

Q.4. Discuss briefly about 1-persistent, p-persistent and non-persistent CSMA protocols and differentiate them.

Q.5. Discuss the following terms in the context to data communication :

(a) Broadcast Routing

(b) Virtual Circuit Network

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Total No. of Questions : 22 Total No. of Pages : 04

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# 6E7153

## B.Tech. VI-Sem. ( Main / Back ) Exam. - 2024

## ELECTRONICS AND COMMUNICATION ENGG.

## 6EC4-03 / Fiber Optics Communications

Time : 3 Hours Maximum Marks : 70

**Instructions to Candidates :**

**Note : Attempt all 10 questions from Part-A, 05 questions out of 07 questions from Part-B and 03 questions out of 05 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)*

1. ..... 2. .....

**PART-A** **[10x2=20]**

**(Answer should be given up to 25 words only)**

**All question are compulsory**

Q.1. State the requirements that are to be met in selecting materials for optical fibers.

Q.2. What do you mean by pulse broadening in optical fiber ?

Q.3. Give the names of materials used for fabrication of optical fibers.

Q.4. Define the relative refractive index difference for an optical fiber and show how it may be related to the numerical aperture.

Q.5. What is quantum efficiency ?

Q.6. What is source to fiber power launching ?

Q.7. What is non-linear scattering ? Write the names of two non-linear scattering.

Q.8. What do you mean by modulation of LED ?

Q.9. Define spectral width, group velocity and group delay.

Q.10. What do you mean by model noise in optical fiber and how it may be avoided.

**PART-B** **[5x4=20]**

**(Analytical/Problem Solving questions)**

**Attempt any five questions**

Q.1. Briefly explain the different mode of fiber characteristics and draw their refractive index profile.

Q.2. Draw the neat diagram of the experimental setup for the measurement of dispersion and explain it.

Q.3. A step index fiber has a NA of 0.17 and core diameter of 100 $\mu$m. Determine the normalized frequency parameters of the fiber when light of wavelength 0.85 $\mu$m is transmitted through it.

Q.4. An APD has quantum efficiency of 40% at 1.3 $\mu$m . When illuminated with optical power of 0.3 $\mu$W at this wavelength, it produces an output photocurrent of 6 $\mu$A, after avalanche gain. Calculate the multiplication factor of diode.

Q.5. Draw the schematic diagram of DWDM and explain its working.

Q.6. Explain the factors contributing dispersion and types of dispersion in detail.

Q.7. Explain the working principle of EDFA amplifier.

**PART-C** **[3x10=30]**

**(Descriptive/Analytical/Problem Solving Design/Questions)**

**Attempt any three questions**

Q.1. Optical power of 5m W launched into an optical fiber at a distance of 10 km gives an output power of 4m W. Find the attenuation of fiber per km. What power should be launched into the fiber if 100 $\mu$m of power is required at a distance of 80km ?

Q.2. What are the necessary conditions for LASER action ? Define threshold condition of LASER diode.

Q.3. Discuss with the aid of suitable diagrams, the following techniques of mechanical splicing and coupling :

(i) Spring Groove Splice

(ii) Fusion Splice

(iii) Lansing Schemes

Q.4. What is meant by OTDR ? Discuss with the aid of diagram, how this method may be useful in field measurement ? In addition, mention the merits of this technique.

Q.5. What are Homo-junction and Hetero-junctions ? Draw schematic and explain the working of double Hetero-structure edge-emitting LED.

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# 6E7154

## B.Tech. VI-Sem. ( Main / Back ) Exam. - 2024

## ELECTRONICS AND COMM. ENGG.

## 6EC4-04 Antennas and Propagation

Time : 3 Hours Maximum Marks : 70

**Instructions to Candidates :**

**Note : Attempt all 10 questions from Part-A, 05 questions out of 07 questions from Part-B and 03 questions out of 05 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)*

1. ..... 2. .....

**PART-A** **[10x2=20]**

**(Answer should be given up to 25 words only)**

**All question are compulsory**

1. Draw the E-plane radiation Pattern of a dipole antenna.

2. If a 20 meter length dipole antenna working at 10 MHz frequency them find its electrical length.

3. Write 2 application of a smart Antenna.

4. Write the relation between gain and directivity of an antenna.

5. State the reciprocity property of an antenna.

6. Write the name two feeding method used in Microstrip antenna.

7. Give one example of a linear and non-linear array of antenna.

8. Write the upper limit of frequency used in ground wave propagation.

9. Write one difference between a grounded and ungrounded antenna.

10. If the total radiated power from an antenna is 100 wats then calculate its average radiation intensity.

## PART-B

**[5x4=20]**

**(Analytical/Problem Solving questions)**

**Attempt any five questions**

1. Find the current required to radiate a power of 100 watt at 100 MHz from a 0.01 meter Hertzian dipole.

2. Define following antenna Parameter :

   (i) Front to Back ratio (FBR)

   (ii) Antenna beam width

3. Calculate the efficiency and radiated power form a dipole antenna. Assume its feeding source has source resistance 50 Ω, conducting loss of antenna is 5 milliwatt, feeling current is 20 MA.

4. Explain the working of V-antenna. How it will give unidirectional radiation pattern ?

5. Design a Broad Side antenna array of 4-element at 10 MHz. frequency. Also draw its radiation Pattern.

6. Explain the working of Log-Periodic antenna. Also discuss why it called Broadband antenna.

7. What is Beamforming Concept ? Explain its fixed and variable weight concept.

**PART-C** **[3x10=30]**

**(Descriptive/Analytical/Problem Solving Design/Questions)**

**Attempt any three questions**

1. Derive the expression of far field Electric field from a short current element. Ass-Assure the current element is placed along Z-axis. Also discuss the near field and far field from an antenna.

2. What is corner reflector and Parabolic disc reflecting used in radiating antenna. Also discuss How the radiation Pattern Modify by These reflector when used as receiving antenna ?

3. Draw the resultant radiation Pattern from a two element array having identical radiator speed $\lambda / 4$ a part and current in one radiator lags behind other by 90°.

4. Define the Maximum useable and critical frequency in wave pro Pagation. If the critical frequency for larger E and F is found 2.5 MHz and 8.5 MHz respectively then find the electron density for these layer.

5. Explain the Woodward-Lawson Method of antenna design.

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# 6E7190

## B.Tech. VI-Sem. ( Main/Back ) Exam. - 2024

## Electronics and Communication Engg.

## 6EC 4-05 5 G Communication

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)*

1. ..... 2. .....

**PART-A** **[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. Define the main differences between 4G LTE and 5G NR technologies.

Q.2. What are the key requirements that drive the need for 5G communication?

Q.3. Explain the concept of spectrum sharing in the context of 5G networks.

Q.4. What is the significance of small cell deployments in 5G?

Q.5. Describe OFDM and its role in 5G technology.

Q.6. How does NOMA differ from traditional multiple access techniques?

Q.7. What are the challenges associated with millimeter-wave communications in 5G?

Q.8. Briefly explain the concept of network slicing in 5G.

Q.9. What is the purpose of beamforming in 5G networks?

Q.10. How does D2D communication enhance 5G network performance?

**PART-B** **[5×4=20]**

**(Analytical/Problem solving questions)**

**Attempt any five questions**

Q.1. Discuss the propagation scenarios and challenges in 5G channel modeling.

Q.2. Analyze the impact of interference management on the performance of a 5G network.

Q.3. Compare and contrast the RAN architectures in 4G and 5G

Q.4. Evaluate the performance benefits of using Massive MIMO in 5G networks.

Q.5. Assess the role of SDN and NFV in achieving E2E network slicing.

Q.6. Discuss the potential of 5G technology in transforming vehicular communication.

Q.7 Explain the importance of radio resource management in mobile broadband D2D communication.

## PART-C [3×10=30]

**(Descriptive/Analytical/Problem Solving/ questions)**

**Attempt any three questions**

Q.1. Provide a detailed overview of the evolution from 3G to 5G, including the advancements in LTE and LTE-A Pro.

Q.2. Describe the physical layer design considerations for 5G, including channels, signals and frame structure.

Q.3. Discuss the deployment scenarios for small cells in 5G and their performance analysis.

Q.4. Explain the modulation and access techniques used in 5G, such as FBMC and OFDMA.

Q.5. Detail the design and challenges of millimeter-wave communications, including beam-forming and mobility management.

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Total No. of Questions : 22 Total No. of Pages : 04

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# 6E7156

## B.Tech. VI-Sem. (Main ) Exam. 2024

## ELECTRONICS AND COMM. ENGINEERING

## 6EC5-11 Introduction to MEMS (El.-II)

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

**Instructions to Candidates :**

**Note : Attempt all 10 questions from Part-A, 05 questions out of 07 questions from Part-B and 03 questions out of 05 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)*

1. ..... 2. .....

**PART-A** **[10x2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

**Q.1.** State the difference between MEMS and microsystem.

**Q.2.** What is actuator?

**Q.3.** Explain Poisson effect.

**Q.4.** What is the importance of Young Modulus of elasticity?

**Q.5.** What is Epitaxy? State the difference between homo and hetro epitaxy?

**Q.6.** What is the use of photoresist in Lithoraphy?

**Q.7.** Which PVD techniques mostly used for metal contacts fabrication and why?

**Q.8.** What is the different types of printing in Lithography?

**Q.9.** Why silicon is used commonly as substrate for MEMS?

**Q.10.** Which etchants are commonly used to etch silicon?

## PART-B

**[5x4=20]**

**(Analytical/Problem solving questions)**

**(Attempt any five question)**

**Q.1.** Describe the role of sacrificial layers in surface micromachining with figures. Give examples of two sacrificial materials used in micro system fabrication.

**Q.2.** What is the importance of Miller Indices during etching? Explain briefly.

**Q.3.** What are the different technique to deposit silicon dioxide? Explain any one of them in detail.

**Q.4.** What is elastic and plastic deformation? Explain using suitable diagam.

**Q.5.** Write a brief note on finite element method for analysis.

**Q.6.** What is the importance of vacuum during MEMS fabrication? Explain briefly.

**Q.7.** How $SnO_2$ thin film can be fabricated using dc sputtering system? Explain in detail.

**PART-C** **[3x10=30]**

**(Descriptive/Analytical/Problem Solving/Design question)**

**Attempt any three questions**

**Q.1.** Explain with figures, the steps in surface micro machining. Discuss the various fabrication challenges associated with surface micromachining.

**Q.2.** Explain the modelling of coupled electromechanical system.

**Q.3.** What is the advantage of LIGA process over other micro machining technique? Explain with block diagram the steps in LIGA process.

**Q.4.** (a) State the difference between isotropic and anisotropic etching using suitable examples.

(b) What is Wafer bonding? Explain briefly.

**Q5.** Write short notes on the following :

(i) Linear thermal expansion

(ii) Deep reactive ion etching (DRIE)

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Total No. of Questions : 14 Total No. of Pages : 04

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# 6E1591

## B.Tech. VI-Sem. (Back ) Exam. - 2024

## Electronics & Comm. Engg.

## 6EC 3-01 / Power Electronics

## EC, EI

**Time : 2 Hours** **Maximum Marks : 80**

***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 the following supporting material is permitted during examination.*

*(Mentioned in Form No. 205)*

1. ..... 2. .....

**PART-A** **[5×2=10]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. Define latching and holding current.

2.66

Q.2 Draw the circuit diagram and waveform for single phase half-bridge voltage source inverter with R load.

Q.3. Draw and explain the switching characteristics of SCR.

Q.4. What is UPS? Write down its engineering applications.

Q.5. Draw and explain the I-V characteristics of SCR.

**PART-B** [4x10=40]

**(Analytical/Problem solving questions)**

**Attempt any four questions**

Q.1. Illustrate the working of 3 phase bridge inverter with R Load in 180-degree mode along with the firing sequence and required circuit diagram.

Q.2 Explain the working of separately excited DC motor and DC series motor.

Q.3. Draw the circuit of Single-phase half wave-controlled rectifier along with waveform for a resistive load and derive three expression for DC average output voltage.

Q.4. Derive the expression for output voltage in Boost Converters along with the required circuit diagram.

Q.5. Illustrate the current flow in DIAC with the help of a diagram along with its structure and I-V characteristics.

Q.6. The input to the step-up chopper is 200V. The output required is 600V. If the conducting time of the thyristor is 200 sec. Compute the Chopping frequency. If the pulse width is halved for a constant frequency of operation, find then new output voltage.

**PART-C** [2x15=30]

**(Descriptive/Analytical/Problem Solving/Design question)**

**Attempt any two questions**

Q.1. A single-phase transformer with a secondary voltage of 230 V, 50 Hz delivers power to load R = 10 Ω through a half-wave-controlled rectifier circuit. For a firing angle delay of 60 degrees calculate.

(a) the rectification efficiency

(b) form factor

(c) voltage ripple factor

(d) transformer utilization factor and

(e) PIV of thyristor.

Q.2 A 230 V, 50 Hz one pulse SCR controlled converter is triggered at a firing angle of 40 degrees and the load current extinguisheast an angle of 210 degrees. calculate the current turn of time, average output voltage and the average load current for R = 5 Ω and L = 2mH.

Q.3. Derive the expression for output voltage and draw corresponding waveform along with the working principle of operation for step-down choppers.

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# B.Tech. VI Sem(Back) Exam June 2024
## Electronics & Comm. Engg.
## 6EC 4-02 Computer Network
## 6E1592

**: 3 Hours** **Maximum Marks: 120**
**Min. Passing Marks: 42**

**npt all ten questions from Part A, five question out of seven from Part B and four questions out of five from Part C.**

natic diagrams must be shown wherever necessary. Any data you feel missing suitably ssumed and stated clearly. Units of quantities used/ calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in m No.205)

1._____ 2._____

**Part A (Answer should be given up to 25 words only)**
**All questions are compulsory**

Differentiate Adaptive and Non-adaptive routing algorithm.

Write names of the parameters A, B, C and D in a queuing model A / B /C / D.

Differentiate between bit stuffing and byte stuffing. Perform bit stuffing procedure for nary sequence 1101111111011111110101001

What do you mean by multicasting?

Discuss resource allocation.

Discuss the utility of socket programming briefly.

What do you mean by Local area network.

Explain the term "Buffering".

Write Little's formula and discuss it.

Name any one connection oriented protocol. **10 x 2 = 20**

**Part B (Analytical/Problem solving questions)**
**Attempt any Five questions**

Q.1 Draw the header of transmission control protocol and discuss it.

Q.2 Discuss Ethernet protocol by showing its header details.

Q.3 Discuss HTTP briefly.

Q.4. Differentiate between virtual circuit and datagram networks.

Q.5 Draw the OSI reference model and discuss briefly the working of each layer.

Q.6 Discuss about various quality of service parameters.

Q.7 What do you understand by MAC protocols? Discuss about their utility in Computer network.

**5 x 8 =40**

**Part C (Deseriptive/Analytical/Problem Solving/Design questions)**
**Attempt any four questions**

Q. 1 What do you understand by congestion control algorithms? Discuss it by taking an example of any one congestion control algorithm.

Q.2 Write briefly about following network connection devices and their specific use:
(i) Hubs (ii) bridges (iii) Switches (iv) Routers

Q.3 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.

Q.4 Discuss Bellman-Ford routing algorithm by taking a suitable example showing various interconnected nodes and any suitable value of weight between adjacent nodes.

Q.5 Discuss about various types of CSMA protocols. **4 x 15 = 60**

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Total No. of Questions : 22 Total No. of Pages : 04

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# 6E1593

## B.Tech. VI-Sem. ( Back ) Exam. - 2024

## ELECTRONICS AND COMM. ENGG.

## 6EC 4-03 / Fiber Optics Communications

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

***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 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)*

1. ..... 2. .....

**PART-A** **[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. Define Step Index and Graded Index Fiber.

Q.2 Name the important reasons of signal degradation.

Q.3. Define the quantum efficiency and responsivity of a p-n diode.

Q.4. What is bending loss?

Q.5. Name three working principles of laser.

Q.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.

Q.7. For a step index fiber, core refractive index $(n_1) = 1.45$ and $\Delta = 0.01$. Calculate the Numerical aperture and clad refractive index $(n_2)$.

Q.8. State Snell's law condition for TIR Phenomenon.

Q.9. What is the purpose of using optical switches in communication link?

Q.10. Write down the name of non-linear effect of optical fiber link.

## PART-B

[5x8=40]

### (Analytical/Problem solving questions)

### Attempt any five questions

Q.1. Explain the working principle of Optical Time Domain Reflectometer (OTDR).

Q.2 Explain the working of He-Ne laser with suitable diagram.

Q.3. Suppose an N*N Star Coupler is constructed of n 3-dB 2*2 coupler, 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.

Q.4. Drive the electric field equations for homogeneous and inhomogeneous medium.

Q.5. Explain the concept of self-phase modulation and group velocity.

Q.6. What is attenuation? Explain the different optical fiber attenuation techniques.

Q.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 μw .

## PART-C

[4x15=60]

**(Descriptive/Analytical/Problem Solving/Design questions)**

**Attempt any four questions**

Q.1. Explain the working principle of EDF amplifier with suitable diagram. How it is different from Raman Amplifier?

Q.2 Draw the experimental set up of fiber attenuation measurement and explain the uses of each setup block.

Q.3. What is the need of WDM modulation in Optical fiber? Explain CWDM and DWDM modulation technique in detail.

Q.4. Derive the relation for model analysis of wave propagation in step index fiber (Cylindrical coordinate).

Q.5. Explain the SLED and ELED structure with suitable diagram. Which LED is better for Optical Communication and why?

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# 6E1594

## B.Tech. VI-Sem. ( Back ) Exam. - 2024

## ELECTRONICS AND COMM. ENGG.

## 6EC4-04 / Antennas and Propagation

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

***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 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)*

1. ..... 2. .....

**PART-A** **[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

1. What is a Infinitesimal Dipole?

2. What is Radiation Resistance? Write formula of Radiation Resistance.

3. What are the parameters to be considered for the design of an helical antenna?

4. Write the names of ground wave.

5. Define critical frequency.

6. Write the potential function in different form.

7. Write the name of different types of polarization.

8. Define Radiation Intensity.

9. What are the different types of aperture?

10. What is duality of antenna?

## PART-B

[5x8=40]

**(Analytical/Problem solving questions)**

**Attempt any five questions**

1. (a) Prove that the radiated power of quarter wave monopole is $P_r = 36.5 I_{eff}^2$.

   (b) Draw the equivalent circuit of antenna. Also define the polarisation, antenna front to back ratio (FBR), antenna bandwidth.

2. Distinguish between endfire and broadside arrays. Show that array of two isotropic sources fed with equal amplitudes and opposite phases acts as an endfire array.

3. Describe the principle of operation of Yagi-Uda antenna. Explain its properties with reference to directivity and beamwidth.

4. What is Smart Antennas? Write the benefits of smart antennas.

5. Write short notes on the following :

(i) Antenna temperature

(ii) Input impedance

6. Find out the beam width between first nulls and power gain of a 2 meter paraboloid reflector operating at 6000 MHz.

7. Explain different modes of Radio wave propagation.

**PART-C** [4x15=60]

**(Descriptive/Analytical/Problem Solving/Design questions)**

**Attempt any four questions**

1. A uniform linear array consists of 16-isotropic point sources with a spacing of $\lambda/4$. If the phase difference $\delta = -90°$. Calculate :

(i) HPBW

(ii) Beam solid angle

(iii) Directivity

(iv) Effective aperture

2. Write short notes on the following :

(i) Broadcast antennas

(ii) Frequency Independent antennas

(iii) Babinet's principle

3. Design of rectangular and circular patch antennas.

4. Explain uniformly spaced arrays with uniform and non-uniform excitation amplitudes.

5. Explain basic characteristics of micro strip antennas and also explain different feeding methods.

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Total No. of Questions : 22 Total No. of Pages : 04

Roll No. : .....

# 6E1595

## B.Tech. VI-Sem. (Back ) Exam. - 2023

## ELECTRONICS & COMM. ENGG.

## 6EC 4-05 Informatin theory and coding

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

***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 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)*

1. ..... 2. .....

**PART-A** [10x2=20]

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. Define Entropy and coding efficiency.

Q.2 Define Shannon channel capacity theorem.

Q.3. What is the hamming distance?

Q.4. Define the physical significane of entropy.

Q.5. An Information A, B, C and D is transmitted with the probability is 1/2, 1/4, 1/8 and 1/8 find entropy.

Q.6. Distinguish Source Coding from Channel Coding and its requirement.

Q.7. What is the significane of a syndrome vector in the context of error control coding?

Q.8 What are the advantages and disadvantages of convolutional codes?

Q.9. How do we use Parity Matrix in Block Coding?

Q.10. Define G and H matrix and show that $G.H^T = 0$.

**PART-B** [5x8=40]

**(Analytical/Problem-solving questions)**

**Attempt any five questions**

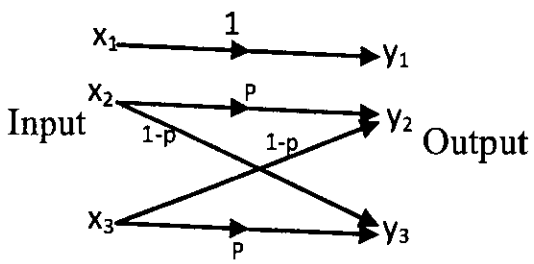
Q.1. Consider (3, 1, 2) convolutional code with g(1) = (110), g(2) = (101) and g(3) = (111) :

(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

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




Q.3. Show that I (X;Y) = H (X) + H (Y) - H (X,Y).

Q.4. Define channel capacity theorem. Showing that channel capacity is dependent on Bandwidth and SNR also defines the trade off between bandwidth and SNR.

Q.5. What is Entropy ? Explain joint entropy and conditional entropy. Write down the properties of entropy.

Q.6. Construct the Huffman code with minimum code variance for the following probabilites and also determine the code variance and code efficiency {1/4, 1/4, 1/8, 1/8, 1/8, 1/16, 1/16}.

Q.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 m1, m2, m3, m4 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** [4x15=60]

**(Descriptive/Analytical/Problem-solving/Design question)**

**Attempt any four questions**

Q.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.

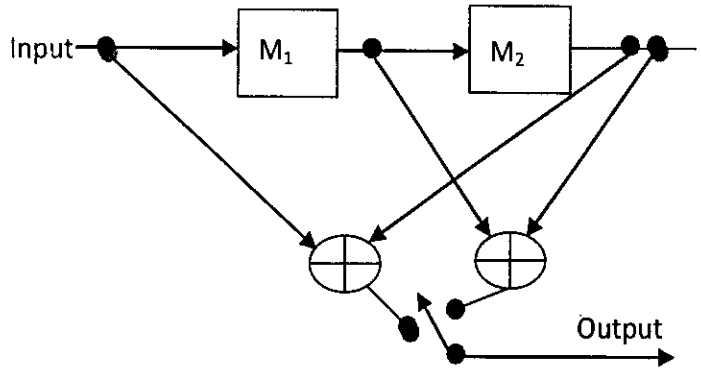
(iii) Draw the encoder and syndrome computation circuit.

Q.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

Q.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.




Q.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

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

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Total No. of Questions : 22 Total No. of Pages : 04

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# 6E1596

## B.Tech. VI-Sem. ( Back ) Exam. June- 2024

## ELECTRONICS AND COMM. ENGG.

## 6EC 5-11 / Introduction to MEMS

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

***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 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)*

1. ..... 2. .....

**PART-A** **[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. Write the all three relations for the Elastic Constants.

Q.2 Name the fabrication methods for MEMS.

Q.3. Draw a typical tensile test curve for the mild steel.

Q.4. What is Hook's Law?

Q.5. What is Wafer bonding and how does it applied to MEMS?

Q.6. Draw the flow diagram of Deposition Process.

Q.7. Names the broad application of MEMS.

Q.8. Write the steps of sacrificial layer processes.

Q.9. Write the formula of Shear Stress.

Q.10. What is "WAHL'S FACTOR".

**PART-B** [5x8=40]

**(Analytical/Problem solving questions)**

**Attempt any five questions**

Q.1. Derive the expression for composite bars thermal stresses, when the bars subjected to tension and compression.

Q.2 A mass of 100 kg fall 4 cm on to a collar attached to a bar of steel 2cm diameter, 3m long. Find the maximum stress set up. Take E = 205,000 N/mm. Use the standard specimen's which are generally used for this purpose.

Q.3. A circular bar 40 mm diameter carries an axial tensile load of 105 kN. What is the value of shear stress on the planes on which the normal stress has a value of 50 $MN/m^2$ tensile?

Q.4. Briefly explain, how electro-mechanical system works? Derive the expression also.

Q.5. With the suitable expressions and diagrams explain the concept of Shear and Bending moment in beams.

Q.6. Differentiate Isotropic Etching and Anisotropic Etching.

Q.7. What are the advantages and disadvantages of scaling effects? Briefly explain the nano sensors working principle with suitable diagram.

## PART-C [4x15=60]

**(Descriptive/Analytical/Problem Solving/Design questions)**

**Attempt any four questions**

Q.1. For a given loading conditions the state of stress in the wall of a cylinder is expressed as follows :

(a) 85 MN/m² tensile

(b) 25 MN/m² tensile at right angles to (a)

(c) Shear stresses of 60 MN/m² on the planes on which the stresses (a) and (b) act; the sheer couple acting on planes carrying the 25 MN/m² stress is clockwise in effect.

Calculate the principal stresses and the planes on which they act. What would be the effect on these results if owing to a change of loading (a) becomes compressive while stresses (b) and (c) remain unchanged.

Q.2 A close coiled helical spring is to carry a load of 5000N with a deflection of 50 mm and a maximum shearing stress of 400 N/mm². If the number of active turns or active coils is 8. Estimate the following?

(i) Wire diameter

(ii) Mean coil diameter

(iii) Weight of the spring. Assume G = 83,000 N/mm²; = 7700 kg/m³.

Q.3. Explain the Mechanical Actuators with suitable diagrams and expressions used for understanding the mechanism of these actuators for MEMS.

Q.4. Derive the displacement and Stress/ Strain relation (at low fields) for piezoelectric, also explain about the parameter of piezoelectric.

(a) Piezoelectric Strain Constant (d)

(b) Piezoelectric Strain Constant (g)

(c) Electromechanical Coupling Factor (k)

(d) Energy Transmission Coefficient ($\lambda$)

Q.5. Explain the process of Bulk Micromachining of Silicon.

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Total No. of Questions: 22 Total No. of Pages: 2

Roll No. _____

# B.Tech. VI-Sem. (Back) Exam 2024
# Electronics and Communication Engineering
# 6EC4-05 Information Tehory and Coding
# 6E7155

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

**Attempt all 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 missing may suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

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

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

## All questions are compulsory

Q.1 Define entropy in the context of information theory.

Q.2 What is the significance of Shannon's noiseless coding theorem?

Q.3 Explain the concept of a Markov source.

Q.4 State Shannon's noisy coding theorem.

Q.5 How is channel capacity calculated for a discrete memoryless channel?

Q.6 Differentiate between a cyclic code and a convolutional code.

Q.7 Describe the purpose of Huffman coding.

Q.8 What is a uniquely detectable code?

Q.9 Explain the concept of redundancy in coding.

Q.10 What is the role of an error detection code? **10×2=20**

## PART B(Analytical/Problem Solving)

## (Attempt any five questions)

Q.1 Calculate the entropy of a source with the following probabilities for its symbols: \( P(A) = 0.2 \), \( P(B) = 0.3 \), \( P(C) = 0.4 \), \( P(D) = 0.1 \).

Q.2 Given a binary symmetric channel with error probability \( p = 0.1 \), calculate its capacity.

Q.3 Design a Huffman code for a source with the following symbol probabilities: \( P(A) = 0.1 \), \( P(B) = 0.15 \), \( P(C) = 0.3 \), \( P(D) = 0.2 \), \( P(E) = 0.25 \).

Q.4 For a given Markov source with transition probabilities, calculate the entropy rate.

Q.5 Show that the average length of the Huffman code is less than or equal to the entropy of the source plus one.

Q.6 Prove the converse of Shannon's noisy coding theorem for discrete channels.

Q.7 Calculate the error detection capability of a cyclic code with a given generator polynomial. 5×4=20

## PART C(Descriptive/Analytical/Problem Solving)

### (Attempt any three questions)

Q.1Explain the concept of entropy in detail and how it quantifies the uncertainty in a random variable. Discuss the relationship between entropy and information.

Q.2Derive and explain Shannon's noiseless coding theorem. Discuss its implications for data compression.

Q.3Describe Markov sources and their significance in information theory. Derive Shannon's noisy coding theorem and discuss its importance in communication systems.

Q.4Discuss the method to calculate channel capacity for discrete memoryless channels. Provide examples and explain the bounds on channel capacity.

Q.5Compare and contrast different coding techniques such as Huffman codes, cyclic codes, and convolutional codes. Discuss their applications, advantages, and limitations in error detection and correction. 3×10=30