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FIRST/SECOND SEMESTER M.TECH DEGREE SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**ANTENNA THEORY & DESIGN**			
Course Code:	**MLDN201**	**Program:**	**M.Tech in Digital Communication Networking**	
Max Marks:	**100**		**Duration:**	**03 Hours**

Note:

1. Answer ONE question from each MODULE and Question 1 & 2 is compulsory.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Starting from Maxwell's equation, derive the vector wave equation, 'A+ω με A =-μJ, where A is vector potential.	10	1	L3
	b	Explain the following performance parameters with respect to antenna: (i) Radiation pattern (ii) Directivity (iii) Gain (iv) HPBW (v) Antenna impedance	10	1	L2
		Module – 2			
Q2	a	Derive the expression for the array factor of uniformly excited equally spaced linear arrays of 'N' elements	10	1	L3
	b	In linear array shaped beam synthesis, explain the following a) Taylor Line source method(b) The Fourier series method. (c) The Woodward-Lawson sampling method	10	2	L2
		Module – 3			
Q3	a	Derive the expression for radiation resistance for a ideal and short dipole antenna.	10	3	L3
	b	Explain the Microstrip antenna and its application.	10	3	L2
		OR			
Q4	a	Derive the design equation for LPDA geometry.	10	3	L3
	b	Explain the Yagi -Uda array antenna. Explain configuration for general Yagi-Uda antenna with neat diagrams.	10	3	L2
		Module – 4			
Q5	a	With the help of expressions, analyze the various efficiencies involved in the calculation of gain.	10	3	L2
	b	Draw and explain Axi-symmetric parabolic reflector antenna with relevant equations	10	3	L2
		OR			

Q6	**a**	Explain in brief feed antennas used in practice.	**10**	**3**	**L2**
	b	Interpret General feed model for reflector with neat sketches	**10**	**3**	**L2**
Module – 5					
Q7	**a**	Derive the Pocklington's Integral equation in MOM	**10**	**4**	**L3**
	b	Explain how PIFA is suitable for multiband mobile phone antenna design	**10**	**4**	**L2**
OR					
Q8	**a**	Analyze various methods to improve isolation between two closely spaced handset antennas.	**10**	**4**	**L3**
	b	Explain Antenna Noise Temperature and Radiometry with relevant equations and design diagram.	**10**	**4**	**L2**

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FIRST/SECOND SEMESTER M.TECH DEGREE SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**ADVANCED COMMUNICATION SYSTEMS**			
Course Code:	**MLDN202**	**Program:**	**M.Tech in Digital Communication Networking**	
Max Marks:	**100**		**Duration:**	**03 Hours**

Note:

1. Answer ONE question from each MODULE and Question 1 & 2 is compulsory.
2. Any missing Data can be suitably assumed.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Illustrate the elements of a digital communication system using a block diagram. Explain the function of each block.	**5**	**1**	**L2**
	b	Calculate the minimum distance for an M-ary PAM system using the given average symbol energy and number of levels (M).	**8**	**1**	**L3**
	c	A signal is sampled at 12 kHz and encoded with 8 bits per sample. The data is transmitted using 16-level PAM. Compute the bit rate, symbol rate, and required bandwidth for transmission.	**7**	**1**	**L3**
		Module – 2			
Q2	**a**	Interpret the relationship between energy per bit, bit interval, and average transmitted power in a digital system.	**8**	**2**	**L2**
	b	For a binary communication system with signals $s_0(t)=0$ and $s_1(t)=A$ for $0 \le t \le T$, transmitted over AWGN: i) Determine the optimum detector and threshold for equal probability. ii) Derive the probability of error as a function of SNR. iii) Compare the error probability with antipodal signaling.	**12**	**2**	**L3**
		Module – 3			
Q3	**a**	Explain the concept of raised cosine spectrum and analyze its importance in practical filter design.	**8**	**3**	**L2**
	b	A channel has ISI characterized by $x(0)=1$, $x(-1)=0.3$, $x(1)=0.2$. i) Determine the tap coefficients of a three-tap zero-forcing equalizer. ii) Calculate the residual ISI at the output for the optimum coefficients.	**12**	**3**	**L3**
		OR			
Q4	**a**	A binary sequence is transmitted over a channel with impulse response $h(t) = \delta(t) + 0.4\delta(t - T)$. i) Write the expression for the received signal. ii) Calculate the ISI for a pulse with amplitude 1 at t=0. iii) Recommend a suitable equalizer structure for this channel and justify your choice.	**12**	**3**	**L2**

	b	Draw the time-domain and frequency-domain representations of duobinary and modified duobinary signaling. Compare its bandwidth, ISI presence, practicality and key benefits.	**8**	**3**	**L3**
Module – 4					
Q5	**a**	An OFDM system uses 32 subcarriers, each with bandwidth 20 kHz. If the total transmit power is 2 W and the SNR per subcarrier is 18 dB, compute the data rate per subcarrier (QPSK) and the total data rate.	**10**	**4**	**L3**
	b	Explain the water-filling algorithm for optimum power distribution in multicarrier modulation, using suitable mathematical expressions.	**10**	**4**	**L3**
OR					
Q6	**a**	An OFDM system transmits over a channel with frequency-selective fading. The SNR per subcarrier varies as $SNR_i=12+2i$ dB for i=1 to 8 subcarriers. i) Allocate the total transmit power optimally using the water-filling algorithm. ii) Calculate the resulting data rate, assuming QPSK modulation.	**10**	**4**	**L3**
	b	Evaluate the impact of inter-carrier interference (ICI) in OFDM systems caused by frequency offset. Suggest two practical methods to mitigate ICI and justify their effectiveness in real-world applications.	**10**	**4**	**L3**
Module – 5					
Q7	**a**	A direct sequence spread spectrum system uses a PN sequence of length 31 and data rate of 20 kbps. i) Calculate the processing gain. ii) If the required jamming margin is 18 dB and Eb/No =12, determine the minimum length of the PN sequence needed.	**10**	**5**	**L3**
	b	Construct a concept mind map that organizes the major themes and interconnections among the following topics in Advanced Communication Systems: Modulation methods, Channel characteristics, Receiver design, Equalization techniques, Multicarrier systems, Spread spectrum techniques. Label each branch with appropriate keywords and indicate how these concepts relate to system performance and design choices.	**10**	**5**	**L3**
OR					
Q8	**a**	Analyze the synchronization challenges in spread spectrum systems and propose a method for rapid acquisition in direct sequence systems.	**10**	**5**	**L3**
	b	List the key parameters required for a frequency-hopped spread spectrum (FHSS) system used in secure wireless communication and design a frequency-hopped spread spectrum (FHSS) system for secure wireless communication. Specify the required parameters such as number of frequency slots, PN sequence length, and hop rate. Analyze how these parameters influence the system's resistance to jamming and interception.	**10**	**5**	**L3**

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FIRST/SECOND SEMESTER M.TECH DEGREE SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**CRYPTOGRAPHY AND NETWORK SECURITY**			
Course Code:	**MLDN203**	**Program:**	**M.Tech in Digital Communication Networking**	
Max Marks:	**100**		**Duration:**	**03 Hours**

Note:

1. Answer ONE question from each MODULE and Question 1 & 2 is compulsory.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Define Steganography? Explain it briefly.	6	1	L1
	b	Describe Data Encryption Standard (DES) structure with a neat diagram.	8	1	L2
	c	Apply Playfair cipher technique to encrypt “SWARAJ IS MY BIRTH RIGHT” using the keyword “MONARCHY”	6	1	L3
		Module – 2			
Q2	a	State and explain Fermat’s theorem?	6	2	L1
	b	Illustrate Chinese Remainder theorem with an example.	8	2	L2
	c	Alice and Bob uses the Diffie-Hellman key exchange technique. Assume $\alpha = 5$, $q = 11$, $X_A = 2$, determine Y_A, Y_B and K.	6	2	L3
		Module – 3			
Q3	a	List and explain any five properties of pseudo random number generator.	6	3	L1
	b	Outline the working principle and mathematical representation of an LFSR used to generate pseudo random sequences. Give an example.	8	3	L2
	c	Identify the importance of design and analysis of stream ciphers.	6	3	L3
		OR			
Q4	a	Explain Linear Congruential Generators.	6	3	L1
	b	Explain Nanoteq and Rambutan algorithms briefly.	8	3	L2
	c	Illustrate the Algorithm M with an example.	6	3	L3

Module – 4					
Q5	**a**	State the requirements of Hash function?	**6**	**4**	**L1**
	b	Apply Digital Signature Algorithm (DSA) to explain with a function of for signing and verifying.	**8**	**4**	**L3**
	c	Compare Message Authentication Code (MAC) and a One-Way Hash function.	**6**	**4**	**L3**
OR					
Q6	**a**	List the differences between MD4 and MD5.	**6**	**4**	**L1**
	b	Illustrate Secure Hash Algorithm (SHA) with a neat block diagram.	**8**	**4**	**L3**
	c	Identify the requirements that should satisfy by the MAC function.	**6**	**4**	**L3**
Module – 5					
Q7	**a**	What is S/MIME? Summarize the four message related services provide by S/MIME.	**6**	**5**	**L1**
	b	Explain IP Security architecture with a neat diagram.	**8**	**5**	**L2**
	c	Analyze the types of security threats faced when using the web with countermeasures.	**6**	**5**	**L4**
OR					
Q8	**a**	State the benefits of IP Security?	**6**	**5**	**L1**
	b	Outline the fields of top-level format of an Encapsulation Security Payload (ESP) packet with a neat diagram.	**8**	**5**	**L2**
	c	Analyze transport and tunnel mode functionality with respect to AH, ESP and ESP with Authentication.	**6**	**5**	**L4**

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FIRST/SECOND SEMESTER M.TECH DEGREE SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**WIRELESS SENSOR NETWORKS**			
Course Code:	**MLDN204**	**Program:**	**M.Tech in Digital Communication Networking**	
Max Marks:	**100**		**Duration:**	**03 Hours**

Note:

1. Answer ONE question from each MODULE and Question 1 & 2 is compulsory.
2. Any missing Data can be suitably assumed.

Q.No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Discuss the impact of WSNs safety in real world implementation.	**4**	**1**	**L1**
	b	Explain the WSN protocol stack in detail. How does it differ from the traditional TCP/IP stack?	**10**	**1**	**L2**
	c	Explain the characteristics of WSNs that make them suitable for remote and harsh environments?	**6**	**1**	**L3**
		Module – 2			
Q2	**a**	Explain the hardware constraints of sensor nodes in WSNs. How do these constraints influence network design?	**10**	**2**	**L2**
	b	List and explain different physical layer standards relevant to WSNs. Compare IEEE 802.15.4, ZigBee, and IEEE 802.11.	**10**	**2**	**L3**
		Module – 3			
Q3	**a**	How does the limited power and computation capacity of sensor nodes influence the MAC protocol design in WSNs?	**6**	**3**	**L1**
	b	Describe the CSMA/CA (Carrier Sense Multiple Access) mechanism used in WSNs with relevant diagram. What are its advantages and limitations?	**8**	**3**	**L2**
	c	What is contention-based medium access? Explain its working with an example protocol such as S-MAC.	**6**	**3**	**L3**
		OR			
Q4	**a**	Explain the concept of reservation-based medium access in WSNs. How does it help reduce collisions and energy usage?	**6**	**3**	**L1**
	b	Define hybrid MAC protocols? Explain how they combine the benefits of contention-based and reservation-based approaches. Provide examples.	**8**	**3**	**L2**
	c	Discuss the pros and cons of location-based routing in WSNs. What are the challenges in obtaining location information?	**6**	**3**	**L3**

Module – 4					
Q5	**a**	Discuss why traditional TCP/UDP transport layer protocols are not suitable for WSNs. What are the alternative strategies used in WSNs?	**10**	**4**	**L2**
	b	Explain the working of the Pump Slowly, Fetch Quickly (PSFQ) protocol. How does it handle packet loss in downstream communication with neat diagrams?	**10**	**4**	**L3**
OR					
Q6	**a**	Discuss the types of queries used in WSNs. Explain with examples: historical, snapshot, and persistent queries.	**6**	**4**	**L1**
	b	What is source coding in WSNs? Explain the need for data compression in the application layer and its impact on energy efficiency.	**8**	**4**	**L2**
	c	How does in-network processing help improve application-layer efficiency in WSNs? Give examples.	**6**	**4**	**L3**
Module – 5					
Q7	**a**	Write a short note on Magnet OS in wireless sensor networks	**4**	**5**	**L1**
	b	Describe the process of setting up a simulation in TOSSIM. Explain with steps how to simulate a sensor network using a Tiny OS application	**8**	**5**	**L2**
	c	Develop the thread management model used in MANTIS OS and infer the benefits for sensor network applications	**8**	**5**	**L3**
OR					
Q8	**a**	What are the key features of OSPM operating system for sensor networks	**4**	**5**	**L1**
	b	Discuss the features and advantages of the EMERALDS operating system in wireless sensor networks (WSNs). How does EMERALDS address the challenges commonly faced in WSN environments?	**8**	**5**	**L2**
	c	Make use of any three major design issues in Operating Systems. Illustrate their importance in OS functionality	**8**	**5**	**L3**

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FIRST/SECOND SEMESTER M.TECH DEGREE SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**MULTIMEDIA OVER COMMUNICATION LINKS**			
Course Code:	**MLDN215A**	**Program:**	**M.Tech in Digital Communication Networking**	
Max Marks:	**100**		**Duration:**	**03 Hours**

Note:

1. Answer ONE question from each MODULE and Question 1 & 2 is compulsory.
2. Any missing Data can be suitably assumed.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Explain the TS format of TV program multiplexing with neat diagram.	**6**	**1**	**L2**
	b	Illustrate the role of each layer in TCP/IP reference model with neat diagram	**8**	**1**	**L2**
	c	Apply H223 multiplex principles to explain structure of the multiplexed byte stream and usage of multiplex table.	**6**	**1**	**L3**
		Module – 2			
Q2	**a**	Explain IP networking.	**6**	**2**	**L2**
	b	Elaborate the RSVP architecture with a neat diagram.	**8**	**2**	**L2**
	c	Identify the typical structure of an IP network.	**6**	**2**	**L3**
		Module – 3			
Q3	**a**	Outline the block diagram for digital audio signal processing.	**6**	**3**	**L2**
	b	Explain the perceptual audio-coder architecture with relevant diagram.	**8**	**3**	**L2**
	c	Apply the concept of audio sub-band coders to explain wavelet packet decomposition with relevant diagram.	**6**	**3**	**L3**
		OR			
Q4	**a**	With neat diagram discuss the perceptual transform coder.	**6**	**3**	**L2**
	b	Explain the Transform Domain-Weighted Interleave Vector Quantization (TWIN-VQ) encoder with a neat diagram.	**8**	**3**	**L2**
	c	Apply the Transform Audio Coders to explain the optimum coding in the frequency domain with a relevant diagram.	**6**	**3**	**L3**
		Module – 4			
Q5	**a**	What is MPEG? Explain the basic structure of the MPEG-1 audio encoder with a neat diagram.	**6**	**4**	**L2**

	b	Discuss the scope of the MPEG-2 systems standard in relation to the video and audio parts and the broadband equipment with a relevant diagram.	**8**	**4**	**L2**
	c	Identify the main components of the object descriptor (OD) and explain it briefly.	**6**	**4**	**L3**
		OR			
Q6	**a**	What is MPEG-1? Explain the block diagram of basic DCT encoder and decoder structure.	**6**	**4**	**L2**
	b	What is MPEG-2 Audio? Explain the main characteristics of the three layers of MPEG-2 audio coding.	**8**	**4**	**L2**
	c	Apply the concept of System Decoder Model (SDM) to explain Elementary Strem (ES) Synchronization with a relevant diagram.	**6**	**4**	**L3**
		Module – 5			
Q7	**a**	Explain the Packet Voice briefly with neat diagrams.	**6**	**5**	**L2**
	b	Outline Transmitter subsystems with a suitable block diagram.	**8**	**5**	**L2**
	c	Analyze the purpose of information delay in ATM networks and explain the example of multiplexing with respect to frame-based and cell-based interleaving scheme.	**6**	**5**	**L3**
		OR			
Q8	**a**	Define Packet Video? Explain the structure of the video signal.	**6**	**5**	**L2**
	b	Explain the layer structure of a network-based multimedia system with a neat diagram.	**8**	**5**	**L2**
	c	Analyze the Errors and loss handling in ATM Networks.	**6**	**5**	**L3**

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FIRST/SECOND SEMESTER M.TECH DEGREE SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**OPTICAL COMMUNICATION AND NETWORKING**			
Course Code:	**MLDN216C**	**Program:**	**M.Tech in Digital Communication Networking**	
Max Marks:	**100**		**Duration:**	**03 Hours**

Note:

1. Answer ONE question from each MODULE and Question 1 & 2 is compulsory.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	List the various losses in propagation of signals in optical fibers.	4	1	L1
	b	Summarize the working principle of optical isolator and circulator.	8	1	L2
	c	Explain the functionality of coupler in an optical network.	8	1	L3
		Module – 2			
Q2	a	Mention various optical multiplexing techniques based on Efficiency and cost.	4	2	L1
	b	Outline the concept of an optical preamplifier in a long haul system.	8	2	L2
	c	Identify the differences between direct detection and coherent detection schemes.	8	2	L3
		Module – 3			
Q3	a	Mention the importance of SONET/SDH in optical networks.	4	3	L1
	b	Summarize the layers in Asynchronous Transfer Mode.	8	3	L2
	c	Identify and discuss the methods used to reduce the crosstalk in optical communication.	8	3	L3
		OR			
Q4	a	Recall the concept of Asynchronous Transfer mode Signaling.	4	3	L1
	b	Illustrate the SONET/SDH multiplexing with an example	8	3	L2
	c	Explain the concept of power penality in Optical Transmission.	8	3	L3
		Module – 4			
Q5	a	List the functions of Optical line terminals and Amplifiers.	4	3	L1
	b	Explain Wavelength Division Multiplexing (WDM).	8	5	L2

	c	Analyze the concept of wavelength conversion with examples.	**8**	**5**	**L4**
OR					
Q6	**a**	Define the cost trade-offs in WDM network design.	**4**	**3**	**L1**
	b	Explain the concept of Optical Add Drop Multiplexers.	**8**	**5**	**L2**
	c	Analyze the problems of Routing and Wavelength Assignment (RWA).	**8**	**5**	**L4**
Module – 5					
Q7	**a**	Define Optical Safety and its importance.	**4**	**4**	**L1**
	b	Compare the different configuration management techniques.	**8**	**4**	**L2**
	c	Demonstrate how to calculate BER in a network model.	**8**	**4**	**L4**
OR					
Q8	**a**	List the different functions of management functions.	**4**	**4**	**L1**
	b	Illustrate the types of layers within the optical layer.	**8**	**4**	**L2**
	c	Analyze the network management protocols and in optical network.	**8**	**4**	**L4**