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| | | **Course Code: D2514701** | | | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. I Semester MODEL QUESTION PAPER** | | | |
| | | **MATHEMATICAL FOUNDATION FOR COMMUNICATION ENGINEERING** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the concept of sampling distributions and their importance in parameter estimation. | 1 | 2 | 6 |
| | **b).** | A random sample of 50 students gave mean height = 160 cm, SD = 10 cm. Test hypothesis that population mean = 165 cm at 1% level. | 1 | 5 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Describe linear regression. How does it extend to non-linear regression? | 1 | 4 | 6 |
| | **b).** | A company claims average bulb lifetime = 1200 hrs. A sample of 30 bulbs shows mean = 1160 hrs , SD = 80 hrs. Test the claim at 5% level. | 1 | 5 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Derive and explain the transition probability matrix of a Markov chain. | 2 | 4 | 6 |
| | **b).** | A fair coin is tossed repeatedly. Define the state space and construct the Markov chain. | 2 | 2 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Define and classify random processes with examples. | 2 | 2 | 6 |
| | **b).** | Explain the concept of a random walk and its applications in communication systems. | 2 | 3 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Solve $x^3 + x - 1 = 0$ using Newton-Raphson method. | 3 | 4 | 6 |
| | **b).** | Derive the 4th order Runge-Kutta method for solving ODEs. | 3 | 3 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Find eigenvalues and eigenvectors of $A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ | 3 | 4 | 6 |
| | **b).** | Discuss iterative methods for solving algebraic equations: Bisection, Regula-Falsi, Newton-Raphson. | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | State and explain the implicit function theorem with applications. | 4 | 3 | 6 |
| | **b).** | Maximize $f(x,y) = xy \text{ subject to } x^2 + y^2 = 1$ | 4 | 4 | 6 |

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|---|---|---|---|---|---|
| | | **OR** | | | |
| **8.** | **a).** | Explain gradient descent (steepest descent) method with an example. | 4 | 3 | 6 |
| | **b).** | Find maxima and minima of $f(x,y) = x^2 + y^2 - 2x - 2y + 5$ | 4 | 3 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Describe multi-resolution analysis and its applications in data compression. | 5 | 3 | 6 |
| | **b).** | Explain the construction and properties of wavelets. | 5 | 2 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Discuss applications of wavelet transforms in signal and image processing. | 5 | 5 | 6 |
| | **b).** | Decompose signal [3,1,0,4][3,1,0,4][3,1,0,4] using one-level Haar wavelet transform. | 5 | 4 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

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|---|---|---|---|---|---|
| | | **Course Code: D2514702** | | | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. I Semester MODEL QUESTION PAPER** | | | |
| | | **DIGITAL DATA COMMUNICATIONS** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the principle of QAM with the help of a neat diagram. | 1 | 2 | 6 |
| | **b).** | What is a constellation diagram? Explain the constellation diagram of 16QAM. | 1 | 3 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Explain the OSI model for networking in brief. How does it differ from TCP/IP model? | 1 | 2 | 6 |
| | **b).** | What are different types of digital data transmission modes? Explain with examples. | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | With the help of a neat diagram, explain the DTE-DCE interface. | 2 | 2 | 6 |
| | **b).** | Explain the various network topologies and compare the performance of each | 2 | 2 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | What are the various types of error correction codes? Explain any one. | 2 | 3 | 6 |
| | **b).** | Compare the synchronous and asynchronous data link protocols. | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | What are the different types of packet switching? Explain. | 3 | 2 | 6 |
| | **b).** | Explain the architecture of IEEE 802.6. | 3 | 2 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | What are the different functions of bridges in the network? Explain various types of bridges used in the network. | 3 | 2 | 6 |
| | **b).** | Compare the time division and frequency division multiplexing techniques. | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | What is the need for multiplexing and explain various types of multiplexing techniques? | 4 | 2 | 6 |
| | **b).** | Explain various LAN topologies. | 4 | 2 | 6 |

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|---|---|---|---|---|---|
| | | **OR** | | | |
| **8.** | **a).** | Compare various switching techniques in detail. | 4 | 2 | 6 |
| | **b).** | Explain the function of various internetworking devices. | 4 | 2 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Briefly explain various multiple access techniques. | 5 | 2 | 6 |
| | **b).** | What are the demerits in OFDMA? Explain how they can be overcome? | 5 | 3 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Explain the principle and working advantages and applications of CDMA. | 5 | 2 | 6 |
| | **b).** | Explain the principle and working of CSMA/CA technique in detail. | 5 | 2 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

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| | | **Course Code: D2514703** | | | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. I Semester MODEL QUESTION PAPER** | | | |
| | | **IOT AND ITS COMMUNICATION PROTOCOLS** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the fundamental components of IoT architecture. | 1 | 2 | 6 |
| | **b).** | Illustrate the concept of Everything as a Service (XaaS) in IoT. | 1 | 3 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Describe the role of IoT devices and gateways in communication. | 1 | 2 | 6 |
| | **b).** | Analyze how business processes integrate with IoT systems. | 1 | 3 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain the significance of the deployment and operational view in IoT systems. | 2 | 2 | 6 |
| | **b).** | Identify real-world technical design constraints in IoT implementation. | 2 | 2 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Analyze how different architectural views support IoT system design. | 2 | 4 | 6 |
| | **b).** | Interpret the functional view of IoT reference architecture. | 2 | 3 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Explain the working principle of Bluetooth Low Energy in IoT applications. | 3 | 2 | 6 |
| | **b).** | Differentiate between Zigbee Smart Energy and Wireless HART. | 3 | 3 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Analyze the advantages of 6LoWPAN in constrained IoT networks. | 3 | 4 | 6 |
| | **b).** | Discuss the role of RPL protocol in IoT networking. | 3 | 4 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Discuss the need for lightweight transport protocols like SCTP and DCCP in IoT. | 4 | 4 | 6 |
| | **b).** | Compare TCP and UDP for IoT communication. | 4 | 3 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Evaluate the importance of session layer protocols for interoperability in IoT. | 4 | 4 | 6 |
| | **b).** | Explain the use of DTLS in IoT security. | 4 | 3 | 6 |

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| | | **UNIT-5** | | | |
| **9.** | **a).** | Discuss the role of oneM2M in IoT service layer architecture. | 5 | 3 | 6 |
| | **b).** | Compare service layer protocols – oneM2M, OMA, and BBF. | 5 | 3 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Discuss application layer security mechanisms in IoT. | 5 | 4 | 6 |
| | **b).** | Evaluate the role of RPL protocol in IoT security. | 5 | 4 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
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| | | | | **Course Code: D25147A0** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **I M.Tech. I Semester MODEL QUESTION PAPER** | | | | | |
| **SATELLITE COMMUNICATION** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | **Max. Marks: 60 M** | |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the architecture of a satellite communication system with a neat block diagram | 1 | 2 | 6 |
| | **b).** | Discuss the advantages and disadvantages of satellite communication compared to terrestrial communication. | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Write short notes on the applications of satellite communication in different fields. | 1 | 1 | 6 |
| | **b).** | List the frequency bands used in satellite communication. Explain their merits and drawbacks. | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | State and explain Kepler's three laws of planetary motion. How are these laws fundamental to understanding and predicting satellite orbits? | 2 | 2 | 6 |
| | **b).** | A satellite is in an elliptical orbit around the Earth. The perigee and apogee distances are 7,000 km and 21,000 km respectively from the center of the Earth. Calculate the orbital period of the satellite. (Assume Radius of Earth = 6371 km, $\mu = 3.986 \times 10^5$ km$^3$/s$^2$). | 2 | 3 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Write short notes on angular velocity and its significance in satellite motion. | 2 | 2 | 6 |
| | **b).** | Differentiate between Solar day and Sidereal day with suitable diagrams | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | List the major sub-systems of a satellite. Explain the functions of the Telemetry, Tracking, Command, and Monitoring (TTC&M) sub-system with a neat block diagram. | 3 | 2 | 12 |
| | | **OR** | | | |
| **6.** | **a).** | Explain the functions of the Attitude and Orbit Control System(AOCS) | 3 | 2 | 6 |
| | **b).** | Discuss the power sub-system of a satellite with reference to solar panels and batteries. | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |

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|---|---|---|---|---|---|
| **7.** | **a).** | What are the effects of solar eclipses on satellite communication? Suggest remedies | 4 | 3 | 6 |
| | **b).** | Derive the expression for Doppler frequency shift in satellite communication | 4 | 4 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Explain the Sun Transit Outage phenomenon with neat sketches. | 4 | 3 | 6 |
| | **b).** | Discuss how Doppler shift impacts mobile satellite communication and methods to mitigate it | 4 | 4 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain the working of GPS and its applications in satellite navigation. | 5 | 2 | 6 |
| | **b).** | Write a short case study on VSAT applications. | 5 | 4 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Draft a satellite link budget for a clear-sky condition and compute the C/N ratio. | 5 | 4 | 6 |
| | **b).** | Explain the modulation schemes and multiple access techniques used in satellite communication. | 5 | 2 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
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| | | | | **Course Code: D25147A1** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **I M.Tech. I Semester MODEL QUESTION PAPER** | | | | | |
| **OPTICAL COMMUNICATION & NETWORKS** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | What are the main structural components of an optical fiber, and how do they contribute to wave guiding? | 1 | 2 | 6 |
| | **b).** | Explain the difference between step index and graded index optical fibers in terms of their mode propagation and refractive index profiles. | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Describe the mode theory of circular waveguides qualitatively and its significance in optical fiber communication. | 1 | 2 | 6 |
| | **b).** | Outline the typical fabrication process of optical fibers and discuss the key considerations during cabling and installation of fiber optic cables. | 1 | 3 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | What are the structural differences between LEDs and laser diodes, and how do these structures affect their quantum efficiency and modulation capabilities? | 2 | 2 | 6 |
| | **b).** | Explain the threshold conditions for laser diodes and discuss the significance of resonant frequencies in their operation. | 2 | 3 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Describe the working principles of different types of photodiodes such as PIN photodiodes and avalanche photodiodes. | 2 | 2 | 6 |
| | **b).** | Compare various optical detectors in terms of their performance characteristics and discuss the sources and impact of noise in photo detectors. | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Draw and explain the block diagram of an optical communication system. Discuss the role of each block in detail. | 3 | 2 | 6 |
| | **b).** | Explain the principle of direct intensity modulation. What are its advantages, disadvantages, and applications in optical communication? | 3 | 2 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Write an essay on the Laser semiconductor transmitter. Discuss its construction, working principle, characteristics, and importance in fiber optic communication. | 3 | 2 | 6 |

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| | **b).** | Explain the design and features of a 2.5 Gb/s optical fiber communication link. Compare its performance with lower data rate links. | 3 | 3 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Describe the working of an optical transceiver. Explain its role in transmitting and receiving optical signals. | 4 | 2 | 6 |
| | **b).** | Write a detailed note on semiconductor optical amplifiers (SOAs). | 4 | 2 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Explain the SONET/SDH standards. Discuss their frame structure, features, and significance in optical networking. | 4 | 2 | 6 |
| | **b).** | With neat diagrams, describe the working of wavelength division multiplexers and demultiplexers. | 4 | 2 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Describe the importance of polarization control in coherent optical receivers. What techniques are used for polarization alignment? | 5 | 2 | 6 |
| | **b).** | Write an essay on noise in coherent receivers. | 5 | 2 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Discuss the concept of laser line width. Why is it important in coherent detection, and how does it affect system performance? | 5 | 2 | 6 |
| | **b).** | Explain the concept of phase diversity receivers. | 5 | 2 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
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| | | | | **Course Code: D25147A2** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **I M.Tech. I Semester MODEL QUESTION PAPER** | | | | | |
| **SOFTWARE DEFINED RADIO** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | **Max. Marks: 60 M** | |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Mention the benefits of SDR. | 1 | 3 | 6 |
| | **b).** | What are characteristics of software radios? | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Describe the design principles of SDR | 1 | 3 | 6 |
| | **b).** | Explain the need for software radios. | 1 | 3 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain the Noise and Distortion in the RF Chain. | 2 | 3 | 6 |
| | **b).** | Explain in detail about digital AGC with suitable block diagram. | 2 | 3 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Differentiate duplexer and diplexer. | 2 | 3 | 6 |
| | **b).** | Explain about dynamic range as a principle design challenge. | 2 | 3 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | What are the sources of spurious signals in the DDS System? | 3 | 2 | 6 |
| | **b).** | Summarize DDS properties. | 3 | 3 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Discuss about approaches of direct digital synthesis. | 3 | 3 | 6 |
| | **b).** | write a short note on periodic jitter | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Explain about Digital filter banks. | 4 | 3 | 6 |
| | **b).** | Discuss about Timing recovery in Digital Receivers using Multirate Digital filters. | 4 | 3 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | How Multirate techniques reduce the need for expensive filters. | 4 | 3 | 6 |
| | **b).** | Explain about poly-phase filters | 4 | 3 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Discuss in detail about ADC and DAC with neat architectures**.** | 5 | 3 | 12 |

| | | | | | |
|---|---|---|---|---|---|
| | | **OR** | | | |
| **10.** | **a).** | Summarize parameters of practical data converters. | 5 | 3 | 6 |
| | **b).** | Differentiate instantaneous companding and μ-Law companding. | 5 | 3 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Course Code: D25147B0** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **I M.Tech. I Semester MODEL QUESTION PAPER** | | | | | |
| **WIRELESS LANs and PANs** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | **Max. Marks: 60 M** | |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the fundamentals of WLANs and PANs. Compare their scope, coverage, and uses in modern communication systems. | 1 | 2 | 6 |
| | **b).** | With examples, differentiate between WLANs, PANs, WPANs, and WWANs. | 1 | 3 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Discuss in detail the wireless channel characteristics .How do these factors influence system performance in WLANs and PANs? | 1 | 3 | 6 |
| | **b).** | Write about the applications of WLANs and PANs | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain in detail the IEEE 802.11 architecture and services. Discuss how they support wireless LAN operation. | 2 | 2 | 6 |
| | **b).** | With neat diagrams, explain the MAC layer mechanisms of IEEE 802.11. | 2 | 2 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Describe the different IEEE 802.11 standards (a/b/g/n/ac/ax). Compare them in terms of frequency bands, throughput, and applications. | 2 | 3 | 6 |
| | **b).** | What is mobility support and roaming in IEEE 802.11? Explain the QoS enhancements introduced in IEEE 802.11e. | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Explain in detail the evolution of WLAN security protocols. | 3 | 2 | 6 |
| | **b).** | Describe the authentication and encryption techniques used in WLANs. How do these mechanisms ensure secure data transmission? | 3 | 3 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Analyse WLAN performance parameters. How are they influenced by coexistence and interference in dense wireless environments? | 3 | 4 | 6 |
| | **b).** | Write in detail about Wi-Fi 6 and Wi-Fi 6E. Discuss their key enhancements in terms of performance, spectrum utilization, and support for modern applications. | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |

| | | | | | |
|---|---|---|---|---|---|
| **7.** | **a).** | Explain the Bluetooth architecture in detail. Discuss how piconets and scatter nets are formed and maintained. | 4 | 2 | 6 |
| | **b).** | With neat diagrams, describe the Bluetooth protocol stack. Explain the roles of its different layers. | 4 | 3 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Write about Bluetooth profiles A2DP, HID, GATT, and ATT. State their applications. | 4 | 2 | 6 |
| | **b).** | Describe the IEEE 802.15.1 standards. Discuss the enhancements made over different versions and analyse the security features and vulnerabilities in Bluetooth communication. | 4 | 3 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain in detail the IEEE 802.15.4 standard and the Zigbee protocol stack. | 5 | 2 | 6 |
| | **b).** | Describe Ultra-Wideband (UWB) technology (IEEE 802.15.3). Explain its characteristics, advantages, and applications. | 5 | 3 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Write about Near Field Communication (NFC). Compare it with RFID in terms of range, applications, and security. | 5 | 2 | 6 |
| | **b).** | Compare Bluetooth, Zigbee, UWB, and NFC. Discuss their roles in IoT applications using PANs. | 5 | 4 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

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| | | **Course Code: D25147B1** | | | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. I Semester MODEL QUESTION PAPER** | | | |
| | | **MOBILE NETWORKS** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | **CO** | **KL** | **M** |
| **1.** | **a).** | Compare and contrast the IEEE 802.15, 802.11, and 802.16 standards in terms of architecture, protocols, data rates, range, and typical applications. | 1 | 4 | 6 |
| | **b).** | Discuss the evolution of wireless communication standards from WPANs to WiMAX. What technological advancements and user requirements drove this progression? | 1 | 3 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Describe the architecture and operation of a Bluetooth network. | 1 | 3 | 6 |
| | **b).** | Explain the physical and MAC layer mechanisms of WLAN based on the IEEE 802.11 standard, focusing on CSMA/CA. | 1 | 3 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain the evolution of cellular communication from GSM to 3G and the technological improvements and key features introduced at each stage. | 2 | 3 | 6 |
| | **b).** | Explain the working principles of CDMA. Compare IS-95 with CDMA2000. | 2 | 3 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Explain different types of spread spectrum systems, their working principles and compare their applications in wireless communication. | 2 | 3 | 6 |
| | **b).** | Discuss the challenges and techniques used to ensure efficient communication between the Base Station (BS) and the Mobile Station (MS). | 2 | 4 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Define Mobile IP. Discuss its architecture &working principle. Explain the major advancements of IPv6 compared to IPv4 | 3 | 2 | 6 |
| | **b).** | Discuss the different types of handoffs in wireless networks. Explain how handoff strategies affects the quality of service and user experience. | 3 | 4 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Discuss the different variations of TCP designed for wireless networks. | 3 | 4 | 6 |

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| | | Compare their approaches to improving performance over wireless links. | | | |
| | **b).** | Discuss how mobility management in wireless networks can introduce security vulnerabilities. | 3 | 4 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Explain in detail the fundamentals of Ultra-Wideband (UWB) radio communication. How does it differ from conventional radio transmission techniques? | 4 | 3 | 6 |
| | **b).** | With suitable diagrams, describe the operation of a UWB system. | 4 | 3 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Compare UWB with Bluetooth, Wi-Fi, and other wireless technologies in terms of range, data rate, spectrum usage, and application domains. | 4 | 3 | 6 |
| | **b).** | Analyse the advantages and disadvantages of UWB technology. | 4 | 4 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain various routing protocols used in Adhoc networks. | 5 | 2 | 6 |
| | **b).** | Discuss in detail the features, benefits, and challenges of 4G technologies. | 5 | 3 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | What is a smart antenna system? With suitable diagrams, explain the concept of OFDM-MIMO systems. | 5 | 2 | 6 |
| | **b).** | Explain in detail on Software-Defined Radio (SDR) and Cognitive Radio (CR). | 5 | 3 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**



NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Course Code: D25147B2** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **I M.Tech. I Semester MODEL QUESTION PAPER** | | | | | |
| **NETWORK SECURITY & CRYPTOGRAPHY** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Describe the relationship between security services and mechanisms | 1 | 2 | 6 |
| | **b).** | What are the different types of attacks? Explain with examples. | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | What is double DES? What kind of attack is possible on double DES? | 1 | 2 | 6 |
| | **b).** | Explain about Block Cipher Principles? | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain digital signature standard algorithm for authentication? | 2 | 2 | 6 |
| | **b).** | Explain about International Data Encryption algorithm? | 2 | 4 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Explain in detail about the Characteristics of Advanced Symmetric block ciphers. | 2 | 2 | 6 |
| | **b).** | Write short note on Traffic confidentiality, Key distribution. | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Perform encryption/decryption using RSA algorithm for the following: p = 3, q = 11, e = 7, m = 5 | 3 | 6 | 6 |
| | **b).** | What are the main differences between Diffie-Hellman Key exchange, Elliptic Curve Cryptography. | 3 | 2 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Explain about Discrete logarithms. | 3 | 2 | 6 |
| | **b).** | State Chinese remainder theorem and explain with one example. | 3 | 1 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Describe the different cryptographic functions provided by PGP. | 4 | 2 | 6 |
| | **b).** | What is MIME? What are the different content types of MIME? | 4 | 1 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Explain digital signature standard algorithm for authentication? | 4 | 2 | 6 |
| | **b).** | What are HASH functions and how they are helpful in Message Authentications? | 4 | 1 | 6 |

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| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain in detail the architecture of IP Security. | 5 | 2 | 6 |
| | **b).** | How web security can be achieved? What are the different mechanisms? | 5 | 2 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Define the three classes of intruders and mention the intrusion techniques to protect from the intruders. | 5 | 1 | 6 |
| | **b).** | Explain the different types of viruses. | 5 | 2 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
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| | | **Course Code: D2524701** | | | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **MOBILE CELLULAR COMMUNICATION** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the different generations of wireless mobile system | 1 | 2 | 6 |
| | **b).** | Explain different types of multiple access schemes in detail. | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Explain briefly about analog and digital cellular system | 1 | 2 | 12 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain about frequency reuse with an example | 2 | 2 | 6 |
| | **b).** | Compare cell splitting and cell sectoring. | 2 | 2 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Explain the operation of the IEEE 802.11 MAC layer with emphasis on CSMA/CA. Explain the working of Distributed Coordination Function (DCF) and Point Coordination Function (PCF). | 2 | 2 | 6 |
| | **b).** | Discuss briefly about various methods of improving the coverage and capacity of a cellular system? | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Illustrate different multiple access techniques for wireless communication. | 3 | 3 | 6 |
| | **b).** | Compare FDMA ,TDMA and CDMA. | 3 | 2 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Compare Wi-Fi 6 and Wi-Fi 6E. | 3 | 2 | 6 |
| | **b).** | Explain about advanced transceiver schemes in wireless communication. | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Discuss briefly about 3G Air interface technologies and 3G spectrum | 4 | 2 | 6 |
| | **b).** | Compare 2G ,3G,4G technologies. | 4 | 2 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Discuss about smart antenna techniques and limitations of 4G. | 4 | 2 | 6 |
| | **b).** | Distinguish between WCDMA and CDMA2000. | 4 | 2 | 6 |
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| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain the principle of operation of 5G technology. | 5 | 1 | 6 |
| | **b).** | Discuss briefly technical specification and description of 5G technology. | 5 | 2 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Explain the 5G cellular system error correction techniques in detail | 5 | 2 | 12 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Course Code: D2524702** | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **DETECTION AND ESTIMATION THEORY** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | **Max. Marks: 60 M** | |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Define an Autoregressive Process. Calculate the values of mean, variance and autocorrelation values of a First order auto regressive model. | 1 | 3 | 6 |
| | **b).** | Define shot noise. Calculate the values of mean, autocorrelation, and the power spectral density of the shot noise. | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | What is a random process? Write about Markov Processes and Gaussian processes. | 1 | 2 | 6 |
| | **b).** | Explain any one of the procedure for the estimation of mean and variance. | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | What is Minimum Probability of Error? Explain Baye's decision rule. | 2 | 2 | 6 |
| | **b).** | When does the LRT test under minimum probability of error criterion become identical to that under NP criterion? | 2 | 2 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Explain about the neyman-pearson classifier with necessary derivations. | 2 | 3 | 6 |
| | **b).** | Discuss about Maximum Likelihood estimators. | 2 | 3 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Explain the operation of kalman filter with necessary block diagram | 3 | 2 | 6 |
| | **b).** | What is a wiener filter and explain about one of its applications. | 3 | 3 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | What is a minimum mean square error criterion? Differentiate between linear and nonlinear Minimum Mean Squared Error estimators. | 3 | 2 | 6 |
| | **b).** | Explain about Innovations. | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Explain any one of the nonparametric estimator. | 4 | 2 | 6 |
| | **b).** | What is the difference between point and interval estimators? Explain any one method of evaluating the interval estimators. | 4 | 2 | 6 |

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| | | **OR** | | | |
| **8.** | **a).** | Explain the steps in the hypothesis testing of estimators. | 4 | 2 | 6 |
| | **b).** | Explain briefly about Simple Linear Regression. | 4 | 2 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain the differences between Model-free Estimation and Model based Estimation of Autocorrelation Functions. | 5 | 2 | 6 |
| | **b).** | Define Wide Sense Stationary and Strict Sense Stationary Random Processes. Explain the Tests for Stationary. | 5 | 2 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Derive the relationship between the autocorrelation and power spectral density. | 5 | 3 | 6 |
| | **b).** | If an estimated ARMA model is<br>X (N) = 0.9X(n-1)-0.2X(n-2)+0.5e(n-1)+e(n).<br>Find the corresponding autocorrelation function, autocorrelation coefficient, and power density spectrum. | 5 | 3 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | **Course Code: D2524703** | | | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **COMPUTER NETWORKS** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the differences between Circuit Switching and Packet Switching. Discuss with appropriate diagrams and real-world examples | **1** | **2** | **6** |
| | **b).** | Describe the architecture and working of Peer-to-Peer (P2P) networks. How do they differ from Client-Server models? | **1** | **2** | **6** |
| | | **OR** | | | |
| **2.** | **a).** | Explain the structure and function of the Internet architecture and the Network Core | **1** | **2** | **6** |
| | **b).** | Explain in detail the functions of MAC and LLC sub layers in the data link layer | **1** | **2** | **6** |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain the role and functioning of Network Address Translation (NAT) in IP address management | **2** | **2** | **6** |
| | **b).** | Describe the working of the Spanning Tree Protocol (STP) and its role in avoiding loops | **2** | **2** | **6** |
| | | **OR** | | | |
| **4.** | **a).** | Explain the purpose of the Internet Control Message Protocol (ICMP) in network diagnostics. | **2** | **2** | **6** |
| | **b).** | Apply the RIP protocol to calculate the best path in a simple network topology. | **2** | **3** | **6** |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Explain the differences between TCP and UDP in terms of connection, reliability, and use cases. | **3** | **2** | **6** |
| | **b).** | Describe the working of DNS and how it resolves domain names to IP addresses | **3** | **2** | **6** |
| | | **OR** | | | |
| **6.** | **a).** | Explain the key features of TCP Reno and how it improves upon TCP Tahoe for congestion control. | **3** | **2** | **6** |
| | **b).** | Demonstrate how HTTPS secures communication using encryption and digital certificates | **3** | **3** | **6** |
| | | | | | |

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| | | **UNIT-4** | | | |
| **7.** | **a).** | Describe how CSMA/CA works in wireless networks. Why is it preferred over CSMA/CD | **4** | **2** | **6** |
| | **b).** | Apply Dijkstra's algorithm to compute the shortest path in a network with five nodes | **4** | **3** | **6** |
| | | **OR** | | | |
| **8.** | **a).** | Describe the operation of Pure ALOHA and Slotted ALOHA. Which one is more efficient and why? | **4** | **2** | **6** |
| | **b).** | Explain the structure and advantages of IPv6 compared to IPv4 | **4** | **2** | **6** |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain the architecture and function of SONET in optical networking | **5** | **2** | **6** |
| | **b).** | Describe the working of Kerberos authentication protocol. Why is it considered secure? | **5** | **2** | **6** |
| | | **OR** | | | |
| **10.** | **a).** | Explain the working of Voice over IP (VoIP). What are the challenges in its implementation? | **5** | **2** | **6** |
| | **b).** | What is IP Multicasting? Explain its operation and advantages over unicast and broadcast. | **5** | **2** | **6** |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | | | | **Course Code: D25247A0** |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **COGNITIVE RADIO** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Describe the cognitive cycle of a cognitive radio system. | **1** | **3** | **6** |
| | **b).** | Discuss the regulatory aspects and spectrum policies that impact the practical implementation of cognitive radio. | **1** | **2** | **6** |
| | | **OR** | | | |
| **2.** | **a).** | What is dynamic spectrum access? | **1** | **2** | **6** |
| | **b).** | Compare cognitive radios verses traditional radio systems. | **1** | **3** | **6** |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain spectrum sensing challenges. | **2** | **3** | **6** |
| | **b).** | Explain in detail about matched filter detection. | **2** | **3** | **6** |
| | | **OR** | | | |
| **4.** | **a).** | Differentiate cooperative spectrum sensing techniques. | **2** | **3** | **6** |
| | **b).** | Explain about spectrum management. | **2** | **3** | **6** |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | What is position awareness of cognitive radios? | **3** | **2** | **6** |
| | **b).** | Summarize optimization of radio resources. | **3** | **3** | **6** |
| | | **OR** | | | |
| **6.** | **a).** | Discuss about artificial intelligence techniques. | **3** | **3** | **6** |
| | **b).** | Write a short note on environment awareness of cognitive radios. | **3** | **2** | **6** |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Explain about design rules of cognitive radios. | **4** | **3** | **6** |
| | **b).** | Discuss about cognition cycle. | **4** | **3** | **6** |
| | | **OR** | | | |
| **8.** | **a).** | How interface hierarchy of cognitive radio is implement. | **4** | **3** | **6** |
| | **b).** | Explain about architecture maps in cognitive radios. | **4** | **3** | **6** |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Discuss in detail about next generation network architecture. | **5** | **3** | **12** |

| | | | | | |
|---|---|---|---|---|---|
| | | **OR** | | | |
| **10.** | **a).** | Summarize parameters of spectrum mobility. | **5** | **3** | **6** |
| | **b).** | Differentiate upper layer and cross layer issues. | **5** | **3** | **6** |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | **Course Code: D25247A1** | | | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **OFDM & MIMO TECHNIQUES** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the need for OFDM in wireless communication. How does it improve system performance over single-carrier modulation? | 1 | 2 | 6 |
| | **b).** | Explain the role of the cyclic prefix in OFDM systems. How does it help mitigate inter-symbol interference (ISI)? | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Compare time-domain and frequency-domain representations of an OFDM signal with appropriate examples. | 1 | 3 | 6 |
| | **b).** | Describe the concept of orthogonality in subcarriers used in OFDM. Why is it critical for efficient bandwidth utilization? | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain the function of pilot tones in OFDM systems. How do they assist in channel estimation? | 2 | 2 | 6 |
| | **b).** | Illustrate the process of equalization in OFDM systems. Why is it simpler compared to single-carrier systems? | 2 | 3 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Describe the issue of Peak-to-Average Power Ratio (PAPR) in OFDM and discuss one PAPR reduction technique. | 2 | 2 | 6 |
| | **b).** | Demonstrate the performance of OFDM in multipath fading channels with suitable explanation and examples. | 2 | 3 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Describe how multiple antennas improve wireless communication performance in MIMO systems. | 3 | 2 | 6 |
| | **b).** | Explain in detail about Space-time block coding (Alamouti scheme) | 3 | 2 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Describe the role of Channel State Information (CSI) in MIMO systems. How does feedback influence performance? | 3 | 2 | 6 |
| | **b).** | Explain spatial diversity and spatial multiplexing in MIMO. How do they affect data rate and reliability? | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |

| | | | | | |
|---|---|---|---|---|---|
| **7.** | **a).** | Explain the basic principles of beamforming in MIMO systems. Distinguish between digital and Analog beamforming. | 4 | 2 | 6 |
| | **b).** | Explain linear precoding. Give suitable examples where it is used | 4 | 2 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Describe the concept of multi-user MIMO (MU-MIMO). How does it improve overall network capacity? | 4 | 2 | 6 |
| | **b).** | Explain the challenges and benefits of implementing massive MIMO systems in practice. | 4 | 2 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Apply the concept of spatial multiplexing in an OFDM-MIMO system. Illustrate with a block diagram. | 5 | 3 | 6 |
| | **b).** | Explain how combining OFDM and MIMO helps in achieving high-speed wireless communication. | 5 | 2 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Demonstrate the use of adaptive modulation and link adaptation in an OFDM-MIMO system. | 5 | 3 | 6 |
| | **b).** | Explain the synchronization challenges specific to OFDM-MIMO systems. How are they addressed | 5 | 2 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
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| | | | | **Course Code: D25247A2** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **I M.Tech. II Semester MODEL QUESTION PAPER** | | | | | |
| **SMART ANTENNAS AND BEAM FORMING TECHNIQUES** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain radiation mechanism in detail. | 1 | 2 | 6 |
| | **b).** | Distinguish between radiation pattern and radiation intensity. | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Describe the factors that influence the selection of an antenna for a given application. | 1 | 2 | 6 |
| | **b).** | Explain the significance of polarization in antenna performance | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Explain the role of Fourier Transform in antenna array synthesis. | 2 | 2 | 6 |
| | **b).** | Distinguish between Woodward–Lawson and Schelkunoff methods. | 2 | 2 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Explain why Dolph–Tchebyscheff arrays are used for side lobe control. | 2 | 2 | 6 |
| | **b).** | Interpret the importance of the Taylor line source method in beam shaping. | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Explain the advantages of micro strip antennas compared to conventional antennas | 3 | 2 | 6 |
| | **b).** | Distinguish between the transmission line model and the cavity model of analysis. | 3 | 2 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Describe the working principle of a rectangular microstrip patch antenna. | 3 | 2 | 6 |
| | **b).** | Design a rectangular microstrip patch antenna operating at 2.4 GHz using the transmission line model. Assume FR4 substrate with dielectric constant $\varepsilon r = 4.4$ and height $h = 1.6$ mm. | 3 | 3 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Explain why MIMO systems require special antenna design considerations. | 4 | 2 | 6 |
| | **b).** | Explain the use of ground-penetrating radar antennas in practical | 4 | 2 | 6 |

| | | | | | |
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| | | applications. | | | |
| | | **OR** | | | |
| **8.** | **a).** | Describe how the Method of Moments (MoM) is applied in antenna analysis. | 4 | 2 | 6 |
| | **b).** | Describe how the Method of Moments (MoM) is applied in antenna analysis. | 4 | 2 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain the difference between SNR and SINR in beam forming. | 5 | 2 | 6 |
| | **b).** | Describe the function of the Minimum Mean Square Error (MMSE) beam former. | 5 | 2 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Explain why Linearly Constrained Minimum Variance (LCMV) is important in adaptive beam forming. | 5 | 2 | 6 |
| | **b).** | Distinguish between classical beam forming and adaptive beam forming techniques. | 5 | 2 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Course Code: D25247B0** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **I M.Tech. II Semester MODEL QUESTION PAPER** | | | | | |
| **INFORMATION THEORY AND CODING** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Derive the expressions for mutual entropy, mutual information and joint probabilities | 1 | 2 | 6 |
| | **b).** | An analog signal is band limited to 800 Hz, sampled at the Nyquist rate, and the samples are quantized into four levels. The quantization levels are assumed independent and occur with probabilities (1/8, 1/8, 3/8, and 3/8). Find the entropy H(X) and information rate R of the source. | 1 | 3 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | An analog signal is band limited to $f_m$ Hz and sampled at Nyquist rate. The samples are quantized in to 4 levels. Each level represents one symbols. The properties of occurrence of these 4 levels (symbols) are $P(X_1)= P(X_4)= 1/8$ and $P(X_2)= P(X_3)= 3/8$. Obtain information rate of the source. | 1 | 2 | 6 |
| | **b).** | Verify the following expression: $I(X,Y) = H(X) + H(Y) -- H(X,Y)$ | 1 | 3 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Discuss the steps involved in Huffman coding algorithm with a suitable example. | 2 | 3 | 6 |
| | **b).** | A DMS X has five equally likely symbols. Construct a Shannon- Fano code for X, and calculate the efficiency of the code. | 2 | 4 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Discuss in detail about Shannon source coding theorem. | 2 | 3 | 6 |
| | **b).** | A source emits messages with probabilities (1/2, 1/4, 1/8, 1/16, 1/32, and 1/32). Calculate (i) entropy of the source, (ii) Apply Shannon-Fano algorithm to devise a binary code for this source and find its coding efficiency and redundancy. | 2 | 4 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Derive the expression for the channel capacity of AWGN channel. | 3 | 3 | 6 |
| | **b).** | State & explain the Shannon's noisy channel coding theorem. Find the channel capacity of a binary symmetric channel. | 3 | 3 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Discuss about Channel capacity for Lossless channel, Deterministic | 3 | 3 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| | | channel and Noiseless channel. | | | |
| | **b).** | Verify the following expression:<br>$C_s = \log_2 m$ where $C_s$ is the channel capacity of a lossless channel and m is the number of symbols in X. | 3 | 3 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Discuss about Symbol Encoding, Intra frame Coding, Predictive Coding, | 4 | 3 | 6 |
| | **b).** | Explain Sub-band Coding procedure. | 4 | 3 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Discuss about different Image Compression techniques. | 4 | 2 | 6 |
| | **b).** | Explain Multichannel Correlation and Irrelevancy with suitable example. | 4 | 3 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Discuss about Linear block Codes. | 5 | 3 | 6 |
| | **b).** | Demonstrate that (7,4) Hamming code can correct a single error & can detect a double error by syndrome decoding. | 5 | 4 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Write in detail about structural properties of convolution codes. | 5 | 3 | 6 |
| | **b).** | Draw the structure of a rate 1/2 Convolutional coder for $g_1 = [1\ 0\ 1]$ and $g_2 = [0\ 1\ 1]$. Explain the encoding process. Construct the state diagram, trellis diagram & code tree. Find the coder output for input data = [1 0 1 0 1]. | 5 | 3 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | **Course Code: D25247B1** | | | |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R25** |
| | | **I M.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **EMI/EMC** | | | |
| | | **COMMUNICATION SYSTEMS** | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 60 M** |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | All questions carry equal marks | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the concept of electromagnetic compatibility (EMC) with suitable examples. | 1 | 2 | 6 |
| | **b).** | Illustrate how natural sources of EMI affect communication systems. | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Explain the practical experiences and concerns due to EMI in electronic systems. | 1 | 2 | 6 |
| | **b).** | Interpret the role of electrostatic discharge (ESD) in EMI generation. | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Discuss the phenomenon of passive intermodulation in circuits. | 2 | 2 | 6 |
| | **b).** | Illustrate the process of crosstalk in transmission lines with an example. | 2 | 2 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Explain the importance of open area test sites for EMI measurements. | 2 | 2 | 6 |
| | **b).** | Describe the transient effects caused in power supply lines. | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Describe the working principle of an anechoic chamber for EMI testing. | 3 | 2 | 6 |
| | **b).** | Explain the operation of TEM and GTEM cells in EMI measurements. | 3 | 2 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | Discuss the methods of measuring conducted emission on power lines. | 3 | 2 | 6 |
| | **b).** | Explain the role of electrostatic discharge (ESD) tests in EMC design. | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Explain the need for grounding in EMI/EMC protection. | 4 | 2 | 6 |
| | **b).** | Illustrate the effectiveness of shielding in reducing interference. | 4 | 2 | 6 |
| | | **OR** | | | |
| **8.** | **a).** | Explain the role of bonding in EMI/EMC system design. | 4 | 2 | 6 |
| | **b).** | Summarize the importance of isolation techniques in EMC. | 4 | 2 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |

| | | | | | |
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| **9.** | **a).** | Discuss the significance of proper cabling practices for minimizing EMI. | 5 | 3 | 6 |
| | **b).** | Use MIL-STD guidelines to design EMI control measures for aerospace electronic systems. | 5 | 3 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | Implement IEEE EMC standards in the design of wireless communication equipment. | 5 | 3 | 6 |
| | **b).** | Illustrate how automotive EMC standards are applied to minimize interference in vehicle electronic systems. | 5 | 3 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Course Code: D25247B2** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **I M.Tech. II Semester MODEL QUESTION PAPER** | | | | | |
| **RADIO AND NAVIGATIONAL AIDS** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | **Max. Marks: 60 M** | |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | | | |
| | | **UNIT-1** | CO | KL | M |
| **1.** | **a).** | Explain the principles of radio positioning systems and discuss various error sources affecting positioning accuracy. | 1 | 2 | 6 |
| | **b).** | With neat sketches, describe the working of Instrument Landing System (ILS). | 1 | 2 | 6 |
| | | **OR** | | | |
| **2.** | **a).** | Discuss radio positioning configurations and propagation factors affecting terrestrial radio navigation. | 1 | 3 | 6 |
| | **b).** | With neat sketches, describe the working of LORAN. | 1 | 2 | 6 |
| | | | | | |
| | | **UNIT-2** | | | |
| **3.** | **a).** | Define navigation. Explain the concepts of position fixing and dead reckoning with suitable examples. | 2 | 2 | 6 |
| | **b).** | Differentiate between terrestrial radio navigation and satellite navigation. | 2 | 3 | 6 |
| | | **OR** | | | |
| **4.** | **a).** | Describe the working principle of feature matching in navigation systems. | 2 | 3 | 6 |
| | **b).** | Write short notes on integrated navigation systems combining inertial and satellite navigation. | 2 | 2 | 6 |
| | | | | | |
| | | **UNIT-3** | | | |
| **5.** | **a).** | Explain Differential GNSS and its advantages in navigation accuracy. | 3 | 2 | 6 |
| | **b).** | Describe the principle of carrier-phase positioning and attitude determination. | 3 | 2 | 6 |
| | | **OR** | | | |
| **6.** | **a).** | What are the challenges of navigation in poor SNR environments? | 3 | 2 | 6 |
| | **b).** | Explain multipath mitigation techniques in GNSS signal monitoring. | 3 | 2 | 6 |
| | | | | | |
| | | **UNIT-4** | | | |
| **7.** | **a).** | Derive inertial-frame navigation equations and explain their applications. | 4 | 2 | 6 |
| | **b).** | Discuss initialization and alignment methods in INS. | 4 | 2 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| | | **OR** | | | |
| **8.** | **a).** | Explain INS error propagation and its impact on navigation accuracy. | 4 | 2 | 6 |
| | **b).** | Describe horizontal-plane inertial navigation with neat sketches. | 4 | 2 | 6 |
| | | | | | |
| | | **UNIT-5** | | | |
| **9.** | **a).** | Explain GPS, GLONASS, Galileo, and IRNSS systems in detail. | 5 | 2 | 6 |
| | **b).** | Discuss the impact of ionospheric and tropospheric errors on satellite navigation. | 5 | 3 | 6 |
| | | **OR** | | | |
| **10.** | **a).** | What is Dilution of Precision (DOP)? Explain GDOP and PDOP with examples. | 5 | 2 | 6 |
| | **b).** | Describe WAAS and integrity monitoring in GNSS systems. | 5 | 3 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A,B splits** or as a **Single Question** for 12 marks

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Course Code: D2534701** | |
| **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | | | **R25** |
| **II M.Tech. I Semester MODEL QUESTION PAPER** | | | | | |
| **RESEARCH METHODOLOGY AND IPR** | | | | | |
| **COMMUNICATION SYSTEMS** | | | | | |
| **Time: 3 Hrs.** | | | | **Max. Marks: 60M** | |
| Answer **ONE Question** from **EACH UNIT** | | | | | |
| All questions carry equal marks | | | | | |
| Assume suitable data if necessary | | | | | |
| | | | CO | KL | M |
| **UNIT-1** | | | | | |
| **1.** | **a).** | Write briefly about good Research criteria. | 1 | 2 | 6 |
| | **b).** | What are the errors in selecting a research problem? | 1 | 2 | 6 |
| **OR** | | | | | |
| **2.** | **a).** | Describe briefly the Research process with a neat sketch. | 1 | 2 | 6 |
| | **b).** | Describe the scope and objectives of research problems in academic and industrial contexts. | 1 | 3 | 6 |
| **UNIT-2** | | | | | |
| **3.** | **a).** | Write briefly about Effective Literature studies approaches. | 2 | 2 | 6 |
| | **b).** | Explain about Research ethics. | 2 | 2 | 6 |
| **OR** | | | | | |
| **4.** | **a).** | Write briefly about Effective technical writing. | 2 | 3 | 6 |
| | **b).** | Explain about the Format of research proposal. | 2 | 3 | 6 |
| **UNIT-3** | | | | | |
| **5.** | **a).** | Write about the various steps in acquisition of trademarks rights. | 3 | 2 | 6 |
| | **b).** | Discuss research ethics and its role in maintaining academic integrity. | 3 | 3 | 6 |
| **OR** | | | | | |
| **6.** | **a).** | Write briefly about International cooperation on Intellectual Property. | 3 | 2 | 6 |
| | **b).** | Explain the procedure for grants of patents. | 3 | 2 | 6 |
| **UNIT-4** | | | | | |
| **7.** | **a).** | Explain about patent information and databases. | 4 | 2 | 6 |
| | **b).** | Define Intellectual Property Rights (IPR) and explain patents, designs, trademarks, and copyrights. | 4 | 2 | 6 |
| **OR** | | | | | |
| **8.** | **a).** | Write briefly about scope of patent rights. | 4 | 2 | 6 |
| | **b).** | Write briefly about Licensing and transfer of technology. | 4 | 2 | 6 |
| **UNIT-5** | | | | | |
| **9.** | **a).** | Write briefly about Administration in the patent system. | 5 | 2 | 6 |
| | **b).** | Explain the scope of patent rights, licensing, and technology transfer. | 5 | 3 | 6 |
| **OR** | | | | | |
| **10.** | **a).** | Write briefly about New developments in IPR. | 5 | 2 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| | **b).** | Explain IPR case studies involving IITs and their significance in technology commercialization | 5 | 3 | 6 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as **A, B splits** or as a **Single Question** for 12 marks