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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| --- | --- | --- | --- |
| **Course Code** | **23AI2001** | **Duration** | **3hrs** |
| **Course Title** | **ARTIFICIAL INTELLIGENCE FOR CYBER SECURITY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the primary goals of cybersecurity. | | CO1 | R | 1 |
| 2. | State the role of Support Vector Machines (SVM). | | CO1 | R | 1 |
| 3. | Name one limitation of static malware analysis. | | CO2 | R | 1 |
| 4. | State the difference between signature-based and anomaly-based detection. | | CO2 | R | 1 |
| 5. | List the advantages of HMMs in malware analysis. | | CO3 | R | 1 |
| 6. | Enumerate the methods used to detect metamorphic malware. | | CO3 | R | 1 |
| 7. | Define network anomaly detection. | | CO4 | R | 1 |
| 8. | State any one common type of network attack. | | CO4 | R | 1 |
| 9. | Define authentication abuse. | | CO5 | R | 1 |
| 10. | Discuss one key metric for evaluating the fraud detection models. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Illustrate the role of reinforcement learning in AI-driven cybersecurity. | | CO1 | U | 3 |
| 12. | Summarize the limitations of antivirus systems in threat detection. | | CO2 | U | 3 |
| 13. | Differentiate between Host-based IDS (HIDS) and Network-based IDS (NIDS). | | CO3 | U | 3 |
| 14. | Discuss the role of Recurrent Neural Networks (RNNs) in detecting Advanced Persistent Threats (APTs). | | CO4 | U | 3 |
| 15. | Determine the role of Cloud AI in detecting suspicious patterns and securing networks. | | CO5 | A | 3 |
| 16. | Discuss the importance and applications of AI in cybersecurity domains. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Describe the evolution of Artificial Intelligence from expert systems to Machine Learning in cybersecurity. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Compare SVM and Perceptron for email classification, highlighting their strengths and weaknesses. | CO2 | U | 6 |
|  | b. | Distinguish between content-based filtering and non-content-based filtering, and analyze its strengths and limitations in real-world spam detection. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. |  | Illustrate the process of malware analysis and explain the role of Decision Trees and Random Forests in detecting malware. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Write the process of Network Anomaly Detection using AI techniques with an example. | CO4 | A | 6 |
|  | b. | Analyze the Machine Learning algorithms used in botnet detection and intrusion detection systems. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. |  | Determine the role of Artificial Intelligence in strengthening user authentication mechanisms based on keystroke dynamics and behavioral biometrics. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Write in detail the process of account reputation scoring with examples. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Develop an AI-based cybersecurity framework that integrates email threat detection, intrusion detection, and fraud prevention systems. | CO6 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate the use of Cloud-based AI tools such as IBM Watson in implementing fraud detection and predictive analytics systems within a banking scenario where suspicious credit card transactions are analyzed to predict and prevent potential fraud. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Identify email threats such as spamming and phishing using AI algorithms |
| **CO2** | Predict the antivirus limits in threat detection |
| **CO3** | Choose appropriate network intrusions and detect anomalies with machine learning |
| **CO4** | Analyze the strength of biometric authentication procedures with deep learning |
| **CO5** | Determine suspicious patterns and attacks with Cloud AI, thereby allowing to protect network and corporate assets |
| **CO6** | Demonstrate the applicability and necessity of the usage of Artificial Intelligence in multiple domains of cybersecurity |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| **Course Code** | **23AI2004** | **Duration** | **3hrs** |
| **Course Title** | **CONVERSATIONAL ARTIFICIAL INTELLIGENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define conversational AI and state its key components. | | CO1 | R | 1 |
| 2. | List foundational programming blocks used in conversational AI systems. | | CO2 | U | 1 |
| 3. | Describe the role of Natural Language Processing in chatbots. | | CO3 | R | 1 |
| 4. | Identify the main building blocks of dialogue management. | | CO4 | R | 1 |
| 5. | State two applications of AI in contact centers. | | CO5 | R | 1 |
| 6. | Define performance metrics commonly used for chatbot evaluation. | | CO6 | R | 1 |
| 7. | Describe challenges in context understanding for conversational AI. | | CO1 | U | 1 |
| 8. | List types of voice bots with examples. | | CO2 | R | 1 |
| 9. | Explain sentiment analysis in conversational AI. | | CO3 | U | 1 |
| 10. | Identify ethical concerns related to conversational AI. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain how NLP techniques enhance conversational AI accuracy. | | CO1 | U | 3 |
| 12. | Illustrate handling of multi-turn conversations using dialogue management. | | CO4 | A | 3 |
| 13. | Analyze rule-based vs AI-powered voice bots. | | CO3 | An | 3 |
| 14. | Evaluate AI's role in automating customer support in contact centers. | | CO5 | E | 3 |
| 15. | Explain significance of context awareness and personalization in conversational AI. | | CO2 | U | 3 |
| 16. | Predict how performance metrics improve conversational system quality. | | CO6 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Analyze the impact of machine learning models like transformers on natural language understanding in conversational AI. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. | a. | Evaluate the ethical considerations in conversational AI. | CO2 | E | 6 |
|  | b. | Explain few strategies to ensure privacy in chatbot deployments. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. |  | Design a dialogue management system supporting multimodal engagement, explaining each component’s role. | CO3 | C | 12 |
|  |  |  |  |  |  |
| 20. |  | Apply sentiment analysis using BERT to interpret user emotions in a chatbot and discuss user experience improvements. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Evaluate performance metrics used to measure conversational AI success in contact centers. | CO5 | E | 12 |
|  |  |  |  |  |  |
| 22. |  | Examine a healthcare conversational AI case study, detailing implementation challenges and benefits. | CO4 | An | 12 |
| 23. |  | Analyze ethical challenges and mitigation strategies in conversational AI deployment within contact centers. | CO5 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss emerging trends such as emotion recognition and XR integration in conversational AI and their impact on user engagement. | CO6 | E | 6 |
|  | b. | Explain how predictive analytics contributes to enhanced decision-making and customer satisfaction. | CO6 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Represent the fundamentals of conversational Artificial Intelligence. |
| **CO2** | Recognize the basic building components for programming for intelligent systems. |
| **CO3** | Analyze the natural language processing techniques to develop conversational applications. |
| **CO4** | Create and implement conversational intelligence systems and chatbots. |
| **CO5** | Examine the importance of intelligent techniques in conversational technologies. |
| **CO6** | Predict the performance metrics to carry out analytics on conversational systems. |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| **Course Code** | **23AI2006** | **Duration** | **3hrs** |
| **Course Title** | **CYBER THREAT INTELLIGENCE AND ANALYTICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define Cyber Threat Intelligence (CTI). | | CO1 | R | 1 |
| 2. | Identify the key reason for the emergence of private sector intelligence sharing. | | CO1 | U | 1 |
| 3. | Define the term Threat Actor in cyber security. | | CO2 | R | 1 |
| 4. | Identify the key difference between vulnerabilities and exploits. | | CO2 | U | 1 |
| 5. | List the main phases involved in Planning Intelligence Gathering. | | CO3 | R | 1 |
| 6. | State the first step in the intelligence-gathering process. | | CO3 | R | 1 |
| 7. | Explain the three key components of root cause analysis. | | CO4 | U | 1 |
| 8. | List any two sources of Third Party Intelligence Reports. | | CO4 | R | 1 |
| 9. | Define the term Threat Hunting in cybersecurity. | | CO5 | R | 1 |
| 10. | State any two key standards of proof required in cybercrime investigations. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Classify the different types of threat intelligence based on their purpose and level of detail. | | CO1 | U | 3 |
| 12. | Differentiate between untargeted attacks and targeted attacks with suitable examples. | | CO2 | U | 3 |
| 13. | Explain how situational awareness contributes to effective threat detection and decision-making in cyber security operations? | | CO3 | A | 3 |
| 14. | Describe how Third-Party Intelligence Reports assist organizations in enhancing their cyber security posture and strengthening their overall defense mechanisms? | | CO4 | U | 3 |
| 15. | Differentiate between data collection and intelligence generation in the context of the Intelligence Cycle in Practice. | | CO5 | U | 3 |
| 16. | Describe the importance of professionalism in engineering when dealing with ethical dilemmas in cyber security. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Analyze a scenario where a multinational bank is frequently targeted by phishing attacks on its employees. The organization intends to establish a CTI team to predict and prevent such threats. Explain the key steps in developing an effective CTI framework and evaluate how collaboration and intelligence sharing with private sector partners can strengthen the bank’s overall defense capabilities. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. |  | Develop a security strategy for an e-commerce company that is frequently targeted by Distributed Denial-of-Service (DDoS) and credential stuffing attacks. Develop a plan to classify threats, vulnerabilities, and exploits relevant to the company’s operations. Justify how analyzing threat actors’ TTPs and victimology patterns can help in reducing exposure to both targeted and untargeted attacks? | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain each stage of the Cyber Threat Intelligence Lifecycle with suitable neat diagrams and provide the real-world examples for each stage. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Describe the importance of the Hierarchy of Evidence in verifying the reliability of intelligence data collected from multiple sources. | CO4 | U | 6 |
|  | b. | Develop a structured approach for Active Intelligence Gathering that ensures both accuracy and ethical compliance in data collection. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. |  | Analyze a scenario in which a multinational retail company suffers repeated ransomware attacks despite implementing multiple defense layers. During the investigation, several third-party intelligence reports and internal incident reports reveal conflicting information about the source and method of intrusion. Evaluate the role of Root Cause Analysis in identifying underlying vulnerabilities, and propose how tactical and operational reports can aid in short-term mitigation and long-term prevention strategies? | CO4 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain the practical challenges faced in implementing the Intelligence Cycle within large organizations | CO5 | An | 6 |
|  | b. | Develop a structured approach for sharing intelligence securely among stakeholders while ensuring data confidentiality and integrity | CO5 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Develop a structured framework for managing the unexpected in cyber security operations, integrating principles of planning and continuous improvement. | CO6 | A | 6 |
|  | b. | Explain how adherence to professional ethics and legal standards can enhance trust, accountability, and decision-making within cyber security and engineering professions? | CO6 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | **Analyze** the ethical challenges faced by cyber security professionals. | CO6 | An | 6 |
|  | b. | Explain the effectiveness of current attribution mechanisms in cybercrime investigation. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Represent cyber threat intelligence and improvement from antiquity to the present day. |
| **CO2** | Examine how threat intelligence helps to manage risks and how a threat actor goes about attempting to achieve their desired goal. |
| **CO3** | Describe the threat intelligence cycle and elements that comprise the threat intelligence program. |
| **CO4** | Summarize the issues that affect the suitability of sources of intelligence for inclusion in a threat intelligence program. |
| **CO5** | Analyze the linking of a cyber-incident to a specific threat actor. |
| **CO6** | Interpret the practice of transforming information into intelligence. |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| **Course Code** | **23AI2010** | **Duration** | **3hrs** |
| **Course Title** | **ESSENTIALS OF INFORMATION RETRIEVAL TECHNIQUES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Illustrate the role of a Posting list. | | CO1 | U | 1 |
| 2. | List the Components of an inverted index in Information Retrieval. | | CO1 | R | 1 |
| 3. | Identify the role of buffers in reading and writing operations. | | CO2 | R | 1 |
| 4. | List the four indexing techniques in Information Retrieval. | | CO2 | R | 1 |
| 5. | Discuss how a parametric index helps users refine their search results? | | CO3 | U | 1 |
| 6. | Define cosine similarity with a formula. | | CO3 | R | 1 |
| 7. | Illustrate the disadvantage of using Kullback-Leibler (KL) divergence as a ranking function. | | CO4 | U | 1 |
| 8. | Define the formula for Inverse Document Frequency. | | CO4 | R | 1 |
| 9. | Identify the role of Bagging in training datasets. | | CO5 | U | 1 |
| 10. | Illustrate the components of the FLWOR expression. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the effect of stop word removal on dictionary size and retrieval effectiveness in large-scale IR systems. | | CO1 | An | 3 |
| 12. | Differentiate hashing and B-tree approaches for storing dictionary terms in IR systems. | | CO2 | U | 3 |
| 13. | Calculate the BM25F score for a document with the following fields:   * Title: 5 occurrences of the term “AI”, field length = 10 words * Abstract: 3 occurrences of the term “AI”, field length = 50 words * Body: 8 occurrences of the term “AI”, field length = 200 words   Assume the following weights: title = 2, abstract = 1, body = 1. Use BM25F to determine the relevance score of the document for the query containing “AI.” | | CO3 | An | 3 |
| 14. | Discuss the importance of length normalization in computing document scores with example. | | CO4 | U | 3 |
| 15. | Calculate precision and recall for both sets and determine which set is more effective for the query “machine learning applications”, compare the following two unranked retrieval sets:   * Set A: {D1, D2, D3, D4, D5}, with relevant documents {D1, D3, D5} * Set B: {D6, D7, D8, D9, D10}, with relevant documents {D6, D7} | | CO5 | An | 3 |
| 16. | Illustrate how shallow pooling improves the efficiency of evaluation with example? | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Determine the vocabulary of terms from the following corpus and analyze how stop word removal, stemming, and tokenization affect both the vocabulary size and the effectiveness of information retrieval? Illustrate with examples.  **Corpus:**   * D1: "Artificial intelligence is evolving rapidly" * D2: "Machine learning and deep learning are subsets of AI" * D3: "AI applications include healthcare, finance, and robotics" | CO1 | A | 6 |
|  | b. | Explain the difference between the Extended Boolean Model and Ranked Retrieval in terms of document ranking. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Analyze the edit distance between the words “Flaw” and “Lawn” , and explain what the result implies about their similarity. | CO2 | An | 6 |
|  | b. | Evaluate the impact of Tokenization issues on retrieval effectiveness. | CO2 | E | 6 |
|  |  |  |  |  |  |
| 19. |  | Evaluate the efficiency of dictionary compression for large document collections and show how space is reduced in a compressed dictionary for the terms “*information,informative,inform”* using blocked storage and front coding and discuss the overall efficiency gained. | CO3 | E | 12 |
|  |  |  |  |  |  |
| 20. | a. | Explain the step by step process involved in linear interpolation with an example | CO4 | U | 6 |
|  | b. | i)Differentiate between linear interpolation and bayesian smoothing.  ii)Using MLE unigram models for documents and collection mixed with λ = 1/2, compute P(query|d) for the query “revenue down” for both d₁ and d₂, and state the ranking of documents by relevance.  Given:  d₁: *Xyzzy reports a profit but revenue is down*  d₂: *Quorus narrows quarter loss but revenue decreases further* | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. |  | Compare and analyze Bagging vs. Boosting in ensemble learning for document ranking. Discuss their impact on retrieval accuracy. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Apply a Learning-to-Rank algorithm (RankBoost) to the following IPL documents. Compute the final ranking and discuss how relevance judgments influence the result?  Documents:  D1: "Mumbai Indians won the IPL 2023 final" (Highly relevant)  D2: "Chennai Super Kings reached the playoffs" (Partially relevant)  D3: "Royal Challengers Bangalore won the last match" (Moderately relevant) D4: "Delhi Capitals lost against Kolkata Knight Riders" (Not relevant)  D5: "Sunrisers Hyderabad beat Chennai Super Kings" (Moderately relevant). | CO5 | A | 6 |
|  | b. | Discuss the significance of the Text Retrieval Conference (TREC) in benchmarking search engines. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Apply the process of web crawling to describe how crawlers discover, fetch, and index web content for search engines. | CO6 | A | 6 |
|  | b. | Analyze the strengths and limitations of PageRank as a static ranking algorithm in handling spam and link manipulation. | CO6 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Evaluate the advantages and drawbacks of using FLWOR expressions for XML retrieval compared to keyword-based search models. | CO6 | E | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| **CO1** | Interpret the fundamental principles and concepts of information retrieval |
| **CO2** | Describe how search engines work and the basic algorithms used in information retrieval |
| **CO3** | Apply various information retrieval techniques to retrieve relevant information from  different sources |
| **CO4** | Analyze the performance of an information retrieval system using relevant metrics |
| **CO5** | Evaluate the effectiveness of information retrieval systems in meeting user information  needs |
| **CO6** | Design and develop an information retrieval system for a specific domain or use case |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| **Course Code** | **23AI2012** | **Duration** | **3hrs** |
| **Course Title** | **FOUNDATIONS OF GENERATIVE ADVERSARIAL NETWROKS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define a Generative Adversarial Network. | | CO1 | R | 1 |
| 2. | List the main components of a typical GAN architecture. | | CO1 | R | 1 |
| 3. | Name any two variants of GANs. | | CO2 | R | 1 |
| 4. | Define mode collapse in GANs. | | CO2 | R | 1 |
| 5. | Infer the term “discriminator loss” in GANs. | | CO3 | U | 1 |
| 6. | Identify the purpose of generator training. | | CO3 | R | 1 |
| 7. | Summarize the role of GANs in music synthesis. | | CO4 | U | 1 |
| 8. | State one application of GANs in image-to-image translation. | | CO4 | R | 1 |
| 9. | Compare generator and autoencoder networks. | | CO5 | U | 1 |
| 10. | Express the future research directions for GANs. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Illustrate the working of the generator and discriminator. | | CO1 | U | 3 |
| 12. | Identify the difficulties in training the GAN with real time example. | | CO2 | U | 3 |
| 13. | Discuss the steps involved in cleaning and transforming raw image data for GAN training. | | CO3 | U | 3 |
| 14. | Explain the importance of Vector Embedding in GAN. | | CO4 | A | 3 |
| 15. | Construct a simple GAN using TensorFlow to generate hand-written digits (MNIST). | | CO5 | A | 3 |
| 16. | Discuss the ethical implications of GAN-generated content. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the working principles of Variational Auto Encoder in detail. | CO1 | U | 6 |
|  | b. | Apply the concept of backpropagation in GAN training. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain the architecture and working of CycleGAN with examples. | CO2 | A | 6 |
|  | b. | Apply Wasserstein loss in training WGAN to improve model stability. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Develop a preprocessing pipeline for handling imbalanced image datasets. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Predict and construct a GAN model using TensorFlow to create photorealistic images of people, animals, or scenes that do not exist in reality. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Apply GANs for human voice conversion using audio data. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain the impact of feature scaling in model performance and evaluation. | CO3 | U | 6 |
|  | b. | Apply data augmentation techniques to improve GAN output diversity. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 23. |  | Construct a Probabilistic Generative model using PyTorch for image synthesis. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Describe advances in transformer-based generative models such as GPT-2 and StyleGAN. | CO6 | U | 6 |
|  | b. | Apply the concept of attention mechanisms in image generation tasks. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Describe the architecture and components of typical Generative Adversarial Networks (GAN) model |
| **CO2** | Identify different variants of GANs |
| **CO3** | Analyze the performance of GAN model using suitable criteria. |
| **CO4** | Apply GAN for tasks such as image generation, voice, Music and Song. |
| **CO5** | Develop proficiency in implementing GAN models using popular deep learning frameworks. |
| **CO6** | Examine the Future of GAN. |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| **Course Code** | **24AI2002** | **Duration** | **3hrs** |
| **Course Title** | **FOUNDATIONS OF COMPUTER VISION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define the term 'homography' in the context of image transformation. | | CO1 | R | 1 |
| 2. | List the different types of image filters used in noise suppression. | | CO2 | R | 1 |
| 3. | State the significance of edge detection in computer vision. | | CO3 | U | 1 |
| 4. | Define dilation and erosion in binary images. | | CO2 | R | 1 |
| 5. | List two advantages of morphological operations. | | CO4 | R | 1 |
| 6. | State the use of gradient operators in image processing. | | CO3 | U | 1 |
| 7. | List any two activation functions used in convolutional neural networks. | | CO5 | R | 1 |
| 8. | Define triangulation in 3D vision. | | CO6 | U | 1 |
| 9. | State one application of Fourier transform in image analysis. | | CO1 | R | 1 |
| 10. | Define optical flow. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the pinhole camera model and its geometric interpretation. | | CO1 | U | 3 |
| 12. | Describe the process of applying a rank-order filter for salt-and-pepper noise removal. | | CO2 | R | 3 |
| 13. | Explain how Laplacian and Sobel operators differ in edge detection. | | CO3 | U | 3 |
| 14. | Discuss how the Hough Transform helps in detecting circular objects. | | CO4 | U | 3 |
| 15. | Illustrate the role of activation functions in CNN training. | | CO5 | R | 3 |
| 16. | Explain the difference between essential matrix and fundamental matrix in 3D vision. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Analyze how affine and perspective transformations are used in geometric correction of aerial images. | CO1 | An | 12 |
| 18. |  | Evaluate the effectiveness of median, mode, and Gaussian filters in enhancing satellite images. | CO2 | E | 12 |
| 19. |  | Analyze edge and corner detection algorithms for their accuracy in detecting structural boundaries in mechanical parts. | CO3 | An | 12 |
| 20. |  | Apply shape-based pattern recognition to classify objects based on geometric features using real-world datasets. | CO4 | A | 12 |
| 21. |  | Design a convolutional neural network model for classifying handwritten digits and evaluate its performance metrics. | CO5 | C | 12 |
| 22. |  | Develop a stereo matching algorithm to estimate disparity and reconstruct 3D scenes. | CO6 | C | 12 |
| 23. |  | Interpret how Fourier and Wavelet transforms contribute to multi-resolution analysis in texture detection. | CO1 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Propose an optical flow-based framework for tracking vehicles in highway surveillance videos. | CO6 | C | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Apply image processing and feature extraction techniques to practical computer vision tasks. |
| **CO2** | Evaluate image filtering and morphology techniques for enhancing the image quality. |
| **CO3** | Analyze feature detection and texture analysis techniques in image recognition applications. |
| **CO4** | Manipulate images through shape analysis operations like rotation, cropping, scaling,  filtering, and boundary tracking. |
| **CO5** | Develop machine learning and deep learning models to solve classification problems. |
| **CO6** | Create a 3D structure of an object by analyzing multiple 2D images captured from different viewpoints. |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **24AI2003** | **Duration** | **3hrs** |
| **Course Title** | **INTELLIGENT ROBOTICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the main components of a robot. | | CO1 | R | 1 |
| 2. | Define degrees of freedom in robotics. | | CO1 | R | 1 |
| 3. | State the need of lemmatization in NLP. | | CO2 | R | 1 |
| 4. | List the advantages of ROS. | | CO2 | R | 1 |
| 5. | Describe an embedded system. | | CO3 | R | 1 |
| 6. | List the programming languages that can be used in robotics. | | CO3 | R | 1 |
| 7. | Define PID controller. | | CO4 | R | 1 |
| 8. | List the uses of V-REP in robotics. | | CO4 | R | 1 |
| 9. | Identify any two sensors that can be used for measuring distance between a robot and an object. | | CO5 | R | 1 |
| 10. | Define team dynamics in robotics. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Differentiate global path planning and local path planning. | | CO1 | An | 3 |
| 12. | Discuss the various robot learning algorithms. | | CO2 | U | 3 |
| 13. | Summarize the categories of system testing. | | CO3 | U | 3 |
| 14. | Differentiate precision and accuracy in robotics. | | CO4 | An | 3 |
| 15. | Explain the working of a motion sensor and list its components. | | CO5 | U | 3 |
| 16. | Explain the need of swarm robotics with a real time case study. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Describe the steps of path planning in robotics along with its design considerations. | CO1 | U | 6 |
|  | b. | Summarize any four real-time applications of robotics. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. |  | Human robot interaction is a crucial part in robotics. NLP is a helpful paradigm in this scenario. Discuss the nine phases of NLP required in robotics. Also, mention at least three advantages of using NLP in robotics. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | A software company is planning to develop a fire-fighting robot. Illustrate the various phases involved in the product development. Also, mention the activities performed in each phase of development. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Discuss the various phases of user interface design for monitoring robot performance. | CO4 | U | 6 |
|  | b. | Write any two simulation techniques that can be used in robotics. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | Illustrate the steps of RRT algorithm used for motion planning in robotics. | CO5 | A | 6 |
|  | b. | Explain the various wireless communication mechanisms used in robotics. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. |  | Explain the different types (minimum 8) of robots and its characteristics. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain the design principles for UI design in robotics. | CO4 | A | 8 |
|  | b. | Illustrate the working of a PID controller in detail. | CO4 | A | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the safety and efficiency considerations in modelling a robot. | CO6 | U | 6 |
|  | b. | Explain any three use cases of robots that can be applied in healthcare. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Analyze the role of control systems in robotic medical applications. |
| **CO2** | Implement machine learning algorithms to process and analyze visual data within a robotic system. |
| **CO3** | Design a robotic system that demonstrates effective software-hardware interaction to achieve quantifiable effectiveness in task execution. |
| **CO4** | Develop and implement kinematic models of robotic systems using selected simulation software to evaluate the effectiveness of movement strategies. |
| **CO5** | Implement sensors and actuators with a robotic platform to analyze the data and achieve a minimum effectiveness score. |
| **CO6** | Design a conceptual solution to a complex robotics challenge that integrates AI technology and engineering design principles. |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| **Course Code** | **24AI2004** | **Duration** | **3hrs** |
| **Course Title** | **PROMPT ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Identify the language used by humans for communication. | | CO1 | U | 1 |
| 2. | List two examples of statistical models. | | CO1 | R | 1 |
| 3. | Cite the main purpose of debugging in Langchain. | | CO2 | U | 1 |
| 4. | Recall the core modular design principles. | | CO2 | R | 1 |
| 5. | Identify the purpose of context in a prompt. | | CO3 | U | 1 |
| 6. | State the role of instructions in a prompt. | | CO3 | R | 1 |
| 7. | Identify the two main paradigms of evaluation. | | CO4 | U | 1 |
| 8. | List any four use cases of prompt engineering. | | CO4 | R | 1 |
| 9. | Identify any four primary data collection methods in prompt engineering. | | CO5 | U | 1 |
| 10. | Define SHORTEN directive. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Summarize the process of text vectorization. | | CO1 | U | 3 |
| 12. | Describe sequential chains in detail. | | CO2 | U | 3 |
| 13. | **Write** an enhanced prompt using at least three Prompt Modifiers or Control Techniques to instruct an LLM to explain the concept of machine learning to a beginner in a structured and engaging way. | | CO3 | A | 3 |
| 14. | Summarize the automated metrics for evaluation. | | CO4 | U | 3 |
| 15. | Illustrate any three domain specific use cases of prompt engineering. | | CO5 | A | 3 |
| 16. | Describe COLUMN directive. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Describe in detail about statistical models with suitable diagrams. | CO1 | R | 12 |
|  |  |  |  |  |  |
| 18. |  | Explain the mechanisms of error handling and debugging in LangChain applications, emphasizing the role of built-in tools in ensuring reliable execution and recovery from failures during multi-component LLM interactions. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain few-shot learning with suitable diagram. Analyze the effect of “Chain of Thoughts” in few-shot learning and its role in overcoming the limitations of zero-shot learning. Support your answer with a suitable example. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Describe **Human Evaluation** in the context of Large Language Models (LLMs). List and explain the main reasons why human evaluation is necessary. Describe the key dimensions commonly assessed and mention the major methods used for conducting human evaluation. | CO4 | R | 12 |
|  |  |  |  |  |  |
| 21. | a. | Describe the significance of **domain-specific vocabulary, specificity,** and **context** in effective prompt engineering and their contribution in improving the accuracy and relevance of AI-generated responses. | CO5 | U | 6 |
|  | b. | Analyze the integration of APIs, databases, and knowledge bases with LangChain to overcome the inherent limitations of large language models, and evaluate its effectiveness in enabling real-time, context-aware responses. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Apply the concept of domain adaptation to design an effective prompt strategy for a healthcare chatbot that provides patient guidance based on medical records. | CO5 | A | 6 |
|  | b. | **Describe any** three multilingual prompting techniques along with the NLP tasks to which they are commonly applied. | CO5 | R | 6 |
|  |  |  |  |  |  |
| 23. |  | Examine the role of **TRANSLATE** and **DEFINE** prompts in enhancing cross-lingual understanding and domain-specific learning for large language model | CO6 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Describe the working of DEFINE prompts and explain the way they ensure terminological clarity in AI-generated responses. | CO6 | U | 6 |
|  | b. | Apply the concept of **ACT LIKE prompts** to design a scenario where an AI model behaves as a domain expert in legal consultancy. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Analyze prompts to achieve desired outcomes in AI applications. |
| **CO2** | Create and manage prompt templates in LangChain framework |
| **CO3** | Design basic prompts that effectively guide AI models to produce accurate and relevant outputs |
| **CO4** | Design and define evaluation metrics for prompts and monitor it |
| **CO5** | Develop prompts that guide AI systems while incorporating domain-specific terminology |
| **CO6** | Design and implement prompts to execute tasks such as role-playing, data retrieval, translation, calculation, and creative ideation |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| --- | --- | --- | --- |
| **Course Code** | **25AI201** | **Duration** | **3hrs** |
| **Course Title** | **LINEAR ALGEBRA AND CALCULUS FOR ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **LUO** | **RBT Level** | **Related CO** |
| **PART – A (10 X 2 = 20 MARKS)** | | | | |
| 1. | *Compute* the matrix corresponding to the optimization surface of an AI model, given by | 1e | U | 1 |
| 2. | *Enhance* the brightness by 150 in the following grayscale image matrix, A=. | 1f | R | 1 |
| 3. | *List* any two applications of eigen value decomposition. | 2e | U | 2 |
| 4. | *Interpret* the change in a network's dominant eigenvector from to , to determine the most likely indication for the network structure. | 2c | U | 2 |
| 5. | *Formulate* the time execution function T(n) and determine the time complexity type, given that a program has a loop that runs n times, with each iteration taking 4 milliseconds. | 3a | R | 3 |
| 6. | *Calculat*e the gradient of the loss function where x1 denotes the number of failed login attempts and x2 denotes the amount of data sent in MB. | 3e | U | 3 |
| 7. | *Compute* the value of the integral, to characterise a quantum system. | 4e | U | 4 |
| 8. | *Calculate*the total brightness, emitted by a smartphone screen. | 4e | U | 4 |
| 9. | *Identify*the degree and order of the differential equation  which models financial market dynamics. | 5b | R | 5 |
| 10. | *Determine* the solution of the differential equation that represents periodic fluctuations in public sentiment in sentiment analysis. | 5d | U | 5 |
| **PART – B (5 X 6 = 30 MARKS)** | | | | |
| 11. | *Determine* the inverse matrix, A-1, of an encrption matrix A = used by an IoT device, by applying Cayley Hamilton theorem. | 1c | U | 1 |
| 12. | *Compute* the singular values of the customer data matrix A with three metrics, website visits, total time spent, and number of pages viewed, given that  ATA = and interpret the results to assess if a single, fundamental customer engagement dimension exists. | 2d | A | 2 |
| 13. | *Compute* the divergence and curl of the network data flow field  and state whether the field is solenoidal or irrotational. | 3f | U | 3 |
| 14. | *Calculate* the total brightness recorded across the 6 cm length of the chocolate bar, given the brightness function, where   (in cm), as inspected by the line-scan camera. | 4a | A | 4 |
| 15. | *Solve* the differential equation that represents a smoothed trend component of a time series. | 5a | A | 5 |
| **PART – C (5 X 10 = 50 MARKS)** | | | | |
| 16 | A robotics AI system analyses human gait patterns to assess mobility and detect early signs of movement disorders. The system records three features from motion sensors:  x1​: Hip joint angle variation  x2​: Knee flexion rate  x3​: Ankle rotation speed  From a large dataset, the following covariance matrix of the features is obtained: A=   1. *Determine* its eigenvalues and corresponding eigenvectors. 2. *Identify* the principal components in order of importance. 3. *Calculate* the proportion of total variance explained by each principal component. 4. *Determine* the number of principal components required to retain 90% of the variance. | 1a | A | 1 |
| **(OR)** | | | | |
| 17 | *Construct* the link matrix, draw the network diagram and *determine* the page importance using the principal eigen vector for a web structure consisting of three pages where: Page 1 links to Page 2 and Page 3; Page 2 links to Page 1 and Page 3; and Page 3 links to Page 1 and Page 2. | 1b | A | 1 |
|  |  |  |  |  |
| 18 | *Solve* the system of linear equations Ax=b, for the vector x=given the LU decomposition L=, U = and b= of a Gaussian smoothing matrix A. | 2a | A | 2 |
| **(OR)** | | | | |
| 19 | *Determine* the feature weights vector x in a machine learning algorithm by solving the system of linear equations Σx=b, using Cholesky decomposition, given the feature covariance matrix and the measurement vector b= | 2b | A | 2 |
|  |  |  |  |  |
| 20 | *a. Compute* the derivative T1(n) and interpret the rate of change T1(1) of a time execution function T(n) = (3n+2)(2n+5) of an algorithm, where n is the input size.  *b. Determine* the optimal number of worker threads, n that minimizes the graphics-rendering pipeline's execution timeT(n), where the runtime is modeled by the function T(n) = 2n2 - 16n + 80. | 3b | A | 3 |
| **(OR)** | | | | |
| 21 | *Determine* the optimal values for the resource allocation metrics, x (CPU power) and y (memory usage), that minimize the energy consumption objective function, , subject to a performance constraint x+2y=8 within a cloud computing environment. | 3d | A | 3 |
|  |  |  |  |  |
| 22 | *a.Calculate* the total reflected light on the virtual reality (VR) screen, given the brightness function b(x) = x2cosx ;  using integration by parts.  *b. Compute* the total illumination recorded over the camera sensor, given that the light intensity across its horizontal axis is modeled by B(x) = 200, over the domain (units per mm) by using the technique of substitution. | 4c,d | A | 4 |
| **(OR)** | | | | |
| 23 | *a.Calculate* the total surface brightness recorded across the specified region of a GPU chip, given the light intensity distribution function  I(x, y) = 5x2y over the rectangular region defined by  .  *b.Compute* the total volume brightness inside the cube defined by  , given that the light intensity function is, I(x,y,z)=x+y+z. | 4f | A | 4 |
| **Compulsory Question:** | | | | |
| 24 | *Solve* the differential model representing the download growth dynamics of a new mobile application, governed by  where denotes the number of downloads after weeks. Given the initial conditions and *predict* the total number of downloads after 2 weeks. *Interpret* the implications of the growth rate parameters on the app’s popularity trend over time. | 5e | A | 5 |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| --- | --- | --- | --- |
| **Course Code** | **25AI2001** | **Duration** | **3hrs** |
| **Course Title** | **FULL-STACK MOBILE APPLICATION DEVELOPMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define mobile application architecture. | | CO1 | R | 1 |
| 2. | List any two features of Kotlin used in Android app development. | | CO1 | R | 1 |
| 3. | Identify two layout types available in Jetpack Compose | | CO2 | R | 1 |
| 4. | State any two UI components used in SwiftUI. | | CO2 | R | 1 |
| 5. | Identify the purpose of native APIs in mobile development. | | CO3 | U | 1 |
| 6. | Recall the main steps in integrating a device camera API. | | CO3 | R | 1 |
| 7. | Summarize the concept of state management in Flutter or React Native. | | CO4 | U | 1 |
| 8. | Identify the importance of RESTful APIs in mobile apps | | CO4 | R | 1 |
| 9. | Interpret the need for push notifications in mobile user engagement. | | CO5 | U | 1 |
| 10. | Infer the difference between internal testing and production release in app stores. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write a simple “Hello World” Android app using Kotlin. | | CO1 | A | 3 |
| 12. | Summarize the importance of composable functions in building Android UIs. | | CO2 | U | 3 |
| 13. | Apply API calls using Retrofit in an Android project. | | CO3 | A | 3 |
| 14. | Illustrate the role of state management in handling asynchronous data. | | CO4 | U | 3 |
| 15. | Construct a navigation graph for a multi-screen Android app. | | CO5 | A | 3 |
| 16. | Demonstrate the process to prepare an Android app for Play Store deployment. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the Android Activity lifecycle with suitable examples. | CO1 | U | 6 |
|  | b. | Illustrate the steps to build a simple login screen using Kotlin. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Apply responsive design principles using SwiftUI layout modifiers. | CO2 | A | 6 |
|  | b. | Develop a simple UI screen with dynamic lists using Jetpack Compose. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Develop a mobile app that uses native device sensors (GPS or Camera). | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Apply RESTful API integration to fetch and display data from a web server. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Construct a notification workflow in Android using Firebase Cloud Messaging. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | Design a data synchronization module for a mobile app with offline support. | CO4 | A | 6 |
|  | b. | Apply caching techniques to improve app performance. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 23. |  | Develop an app that uses device permissions (location, storage) effectively. | CO3 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Prepare and explain the complete process of deploying a mobile application to both Play Store and App Store. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| **CO1** | Develop basic Android and iOS mobile applications using Kotlin and Swift. |
| **CO2** | Implement mobile UI/UX best practices using Jetpack Compose (Android) and SwiftUI (iOS). |
| **CO3** | Develop mobile applications with native APIs. |
| **CO4** | Interpret state management and RESTful API integration in mobile applications. |
| **CO5** | Develop mobile applications with seamless navigation and push notifications. |
| **CO6** | Deploy mobile applications in Play store and App store. |

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**END SEMESTER EXAMINATION – NOV / DEC 2025**

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| **Course Code** | **25AI2002** | **Duration** | **3hrs** |
| **Course Title** | **GAME DEVELOPMENT AND IMMERSIVE TECHNOLOGIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name one open-source game engine commonly used for 2D and 3D games. | | CO1 | R | 1 |
| 2. | State one key feature of Unreal Engine that makes it suitable for high-end graphics. | | CO1 | U | 1 |
| 3. | State one advantage of using Behavior Trees in game development. | | CO2 | U | 1 |
| 4. | Define NavMesh in Unity. | | CO2 | R | 1 |
| 5. | List any two types of input devices used in game development. | | CO3 | R | 1 |
| 6. | Identify the Unity component responsible for detecting collisions between objects. | | CO3 | U | 1 |
| 7. | List two key features of Oculus SDK. | | CO4 | R | 1 |
| 8. | Name the software commonly used for 3D modeling and animation in AR/VR games. | | CO4 | R | 1 |
| 9. | Name any two networking frameworks used in Unity multiplayer development. | | CO5 | R | 1 |
| 10. | Recognize the importance of asset management in optimizing game performance. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the difference between UI (User Interface) and UX (User Experience) in games. | | CO1 | U | 3 |
| 12. | Explain the use of decorator nodes in behavior trees. | | CO2 | U | 3 |
| 13. | Illustrate how character animations enhance the player’s gaming experience. | | CO3 | A | 3 |
| 14. | Analyze the role of level design in maintaining game balance. | | CO4 | An | 3 |
| 15. | State the benefits of using cloud services in game development. | | CO5 | U | 3 |
| 16. | Discuss the steps involved in publishing and marketing a game on app stores. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain how Newton’s laws of motion are applied in game physics engines like Unity to simulate realistic object movement. Support your answer with examples. | CO1 | A | 6 |
|  | b. | Compare and contrast Unity, Unreal Engine, and Godot in terms of graphics quality, scripting languages, licensing, and use cases in professional game development. | CO1 | E | 6 |
| 18. | a. | Explain Finite State Machine (FSM) and its key features in Artificial Intelligent Non-Player Character (AI NPC) behavior. | CO2 | U | 6 |
|  | b. | Analyze the relationship between game environment design, scoring mechanisms, and player motivation. | CO3 | An | 6 |
| 19. |  | Enumerate and describe the different types of collision detection techniques such as Discrete Collision Detections (DCD) and Continuous Collision Detection (CCD) used in games, highlighting their role in ensuring realistic gameplay. | CO3 | A | 12 |
| 20. |  | Explain how Augmented Reality (AR) works in game development, focusing on its core technologies and types. | CO4 | U | 12 |
| 21. | a. | Explain briefly the client-server model used in multiplayer games | CO5 | U | 6 |
|  | b. | Compare different game monetization strategies such as ads and in-app purchases | CO6 | An | 6 |
| 22. |  | Describe the steps to integrate ARCore/ARKit with Unity for a sample AR game. | CO4 | A | 12 |
| 23. |  | Analyse the importance of game servers in maintaining Real-time multiplayer synchronisation. | CO5 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Apply the A\* pathfinding algorithm to find the shortest path from Node A (start) to Node B (goal) on the following grid. Obstacles are marked with "X" and cannot be crossed. Each move (up, down, left, right) has a cost of 10. Each move diagonally has a cost of 14.  A . . X .  . X . . .  . . . X B | CO2 | A | 8 |
|  | b. | List a few examples where procedural content generation can be used. | CO2 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| **CO1** | Develop expertise in game genres, core mechanics, and engine workflows |
| **CO2** | Implement advanced scripting and Al for gameplay |
| **CO3** | Design interactive gameplay with animation and physics. |
| **CO4** | Build AR/VR-based immersive experiences. |
| **CO5** | Develop multiplayer and cloud-integrated games. |
| **CO6** | Deploy optimized, monetized games across platforms |