

- 1-e. In healthcare ML, what is the potential application of reinforcement learning? CO3, K3 1
- (a) Personalized treatment planning
 - (b) Weather prediction
 - (c) Predicting sports game outcomes
 - (d) Robot-assisted surgeries
- 1-f. ML can improve the accuracy of radiology and medical imaging by: CO3, K3 1
- (a) Making images look more colorful
 - (b) Providing more comfortable imaging procedures
 - (c) Enhancing the speed of image analysis and diagnosis
 - (d) Reducing the number of images taken
- 1-g. Which ML approach is commonly used to model the impact of pollution on ecosystems? CO4, K2 1
- (a) Principal Component Analysis (PCA)
 - (b) k-Nearest Neighbors (k-NN)
 - (c) Natural Language Processing (NLP)
 - (d) Genetic Algorithms
- 1-h. How can Machine Learning models assist in the early detection of disease outbreaks in wildlife populations? CO4, K2 1
- (a) By promoting the spread of diseases
 - (b) By analyzing historical health records of wildlife
 - (c) By advocating for the extinction of species
 - (d) By increasing pollution levels
- 1-i. Which challenge is associated with ensemble methods in machine learning? CO5, K2 1
- (a) Model interpretability
 - (b) Lack of diversity among base models
 - (c) Data preprocessing
 - (d) Overfitting
- 1-j. Which challenge is often faced in feature selection for ML models? CO5, K2 1
- (a) Lack of computational power
 - (b) Model interpretability
 - (c) Data preprocessing
 - (d) Identifying the most relevant features
2. Attempt all parts:-
- 2.a. What types of data are commonly used in Precision Medicine applications? CO1, K2 2
- 2.b. What is the role of ML in identifying key regulators and essential genes in biological networks? CO2, K2 2
- 2.c. How can ML assist in rare disease diagnosis? CO3, K2 2
- 2.d. In environmental bioengineering, what is the primary use of ML in predicting and 2

- managing the impact of pesticide use on non-target species and ecosystems? CO4, K3
- 2.e. Explain the concept of blockchain technology and its potential synergies with machine learning for secure and transparent data management in the future. CO5, K3 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i) Explain the importance of target validation in drug discovery. Explain how Machine Learning contributes to the validation process. CO1, K2 6

3.a.(ii) Explain how machine learning can accelerate drug discovery in biotechnology research. CO1, K2 6

3.b. Answer any one of the following:-

3.b.(i) How can ML assist in identifying non-coding RNA sequences in genomes? CO2, K2 6

3.b.(ii) Discuss the role of network-based drug repurposing and drug-target prediction. (CO2, K3) 6

3.c. Answer any one of the following:-

3.c.(i) Describe the role of ML in enhancing the quality of medical imaging interpretation. CO3, K3 6

3.c.(ii) What challenges are associated with the interpretability of ML models in healthcare? CO3, K3 6

3.d. Answer any one of the following:-

3.d.(i) Explain how Machine Learning contributes to the optimization of sustainable urban green spaces. CO4, K3 6

3.d.(ii) Discuss the role of machine learning in predicting and managing the impact of industrial and chemical contaminants on groundwater quality. CO4, K3 6

3.e. Answer any one of the following:-

3.e.(i) Explain the concept of overfitting in ML and the challenges it poses. Provide strategies to prevent and mitigate overfitting in ML algorithms. (CO5, K3) 6

3.e.(ii) Describe the challenges associated with model selection in hybrid modeling. What factors should be considered for modeling techniques? CO5, K3 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Discuss the role of natural language processing (NLP) in disease diagnosis and prognosis with examples. CO1, K2 10

4-b. Explain the concept and advantages of Bayesian networks in disease diagnosis and prognosis. CO1, K3 10

5. Answer any one of the following:-

5-a. Discuss the application of natural language processing (NLP) techniques in analyzing gene expression literature. CO2, K3 10

5-b. How can ML assist in predicting miRNA-mRNA interactions and their role in gene 10

regulation? CO2, K3

6. Answer any one of the following:-

- 6-a. Discuss the potential of ML in predicting and managing rare adverse drug reactions. CO3, K3 10
- 6-b. Discuss the challenges and opportunities in using ML for telemedicine consultations. CO3, K3 10

7. Answer any one of the following:-

- 7-a. Discuss the role of machine learning in sustainable agricultural irrigation management with examples of optimizing irrigation practices for crop yields and water conservation. CO4, K3 10
- 7-b. Describe the role of predictive modeling techniques in machine learning in predicting and managing the impact of urban expansion on native species and biodiversity conservation with examples. CO4, K3 10

8. Answer any one of the following:-

- 8-a. Explain the significance of model interpretability in hybrid modeling. How can techniques like LIME and SHAP contribute to making complex models more interpretable and transparent? CO5, K3 10
- 8-b. Explain the challenges of handling imbalanced datasets in classification tasks. What techniques and strategies can be used to address this issue effectively? CO5, K3 10