

Duration: 3Hrs.

Maximum Marks : 80

NB:

- (1) Question No. 1 is compulsory.
- (2) Attempt any three questions out of the remaining five.
- (3) All questions carry equal marks.
- (4) Assume suitable data, if required and state it clearly.

- Q1. ATTEMPT ANY FOUR. [20]**
- a. Design AND gate using Perceptron.
 - b. Suppose we have N input-output pairs. Our goal is to find the parameters that predict the output y from the input x according to some function $y = x^w$. Calculate the sum-of squared error function E between predictions y and inputs x. The parameter w can be determined iteratively using gradient descent. For the calculated error function E, derive the gradient descent update rule $w \leftarrow w - \alpha \frac{dE}{dw}$.
 - c. Explain dropout. How does it solve the problem of overfitting?
 - d. Explain denoising auto encoder model.
 - e. Describe sequence learning problem.
- Q2. a. Explain Gated Recurrent Unit in detail. [10]**
b. What is an activation function? Describe any four activation functions. [10]
- Q3. a. Explain CNN architecture in detail. Suppose, we have input volume of $32 \times 32 \times 3$ for a layer in CNN and there are ten 5×5 filters with stride 1 and pad 2; calculate the number of parameters in this layer of CNN. [10]**
b Explain early stopping, batch normalization, and data augmentation. [10]
- Q4 a. Explain RNN architecture in detail. [10]**
b. Explain the working of Generative Adversarial Network. [10]
- Q5 a. Explain Stochastic Gradient Descent and momentum based gradient descent optimization techniques. [10]**
b. Explain LSTM architecture. [10]
- Q6 a. Describe LeNET architecture. [10]**
b. Explain vanishing and exploding gradient in RNNs. [10]

3 Hours

80 Marks

1. Question no. 1 compulsory.
2. Answer any three questions out of remaining five
3. Attempt sub questions in order
4. Figures to the right indicate full marks.

1. Write short notes on (any 4) [20]
 - a) Capacity building
 - b) Functions of NIDM
 - c) Sea walls, embankments and bio shields
 - d) Triage
 - e) Environmental hazard
 - f) National Disaster Management Policy
 - g) Community based disaster preparedness
2. a) Discuss the framework for disaster management in India. [8]
2. b) Explain global warming and climate change. [6]
2. c) Comment on radiation hazards. Also discuss possibilities of chemical spills in Mumbai. [6]
3. a) Discuss the various types of technological disasters and highlight the specific efforts to mitigate such disasters in India. [8]
3. b) Explain the role of various international agencies for Disaster Management. [6]
3. c) Explain various means of raising finance for mitigating and managing disasters [6]
4. a) Differentiate between structural and non-structural measures of flood mitigation and discuss the importance of forecasting, warning and monitoring system in India [8]
4. b) Appraise the role of GIS and GPS in disaster management [6]
4. c) Discuss various types of natural disasters in India and highlight their impacts on life. [6]
5. a) Explain in detail the design concepts involved in as well as the construction materials used for the safe construction of facilities in case of earthquakes and cyclones. Also discuss the fire resistant facilities that need to be essentially provided in a building/industry. [8]
5. b) Elaborate the guidelines laid down by NDMA for disaster management in India. [6]
5. c) Explain in detail, vulnerability, with reference to floods and cyclones. List down the preparatory measures for minimizing vulnerabilities related to Tsunami. [6]

6. a) Discuss in brief the Disaster Management Act 2005. [6]
6. b) Explain Community based disaster preparedness [5]
6. c) Is rapid depletion of ground water a type of disaster? To which category does this belongs?
What are the reasons for this problem? [5]
6. d) Identify and discuss the various hazards which are associated with volcanic eruptions [4]
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[Max Marks:80]

- N.B. :** (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
- a Explain how criminals plan the attack
 - b Explain various security challenges posed by mobile devices
 - c Explain need of Cyber law in India
 - d Explain E-contracts and its different types.
 - e What are Botnets? How it is exploit by attacker to cause cyber-attack?
- 2 a Explain the classification of cybercrimes with examples. [10]
- b Explain Phishing and Identity theft in detail. [10]
- 3 a Explain different buffer overflow attacks also explain how to mitigate buffer overflow attack [10]
- b Explain electronic banking in India and what are laws related to electronic banking in India [10]
- 4 a What do you understand by DOS and DDOS attack? Explain in detail. [10]
- b Write a note on Intellectual Property Aspects in cyber law. [10]
- 5 a Explain SQL injection attack. State different countermeasure to prevent the attack. [10]
- b Explain the objectives and features of IT Act 2000 [10]
- 6 a Explain the term evidence and different types of evidences [10]
- b Write key IT requirements for SOX and HIPAA. [10]

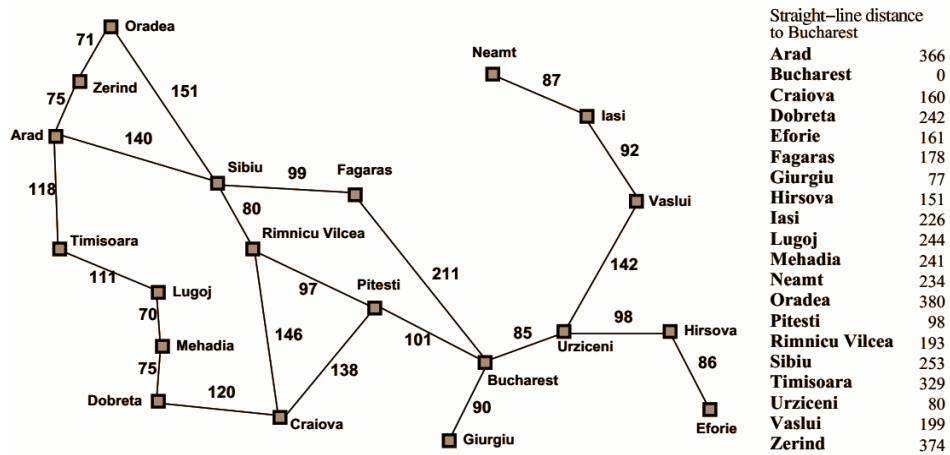
Time : 3 hrs

Marks : 80

- Note: 1. Question number 1 is compulsory.
 2. Solve any three questions out of the remaining five questions
 3. Assume suitable data if necessary.
 4. Figure to the right indicates full marks.

Q.1 Solve any **Four** of the following.

- (a) Consider the graph shown in figure below. Assume that the initial state is Arad and the goal state is Bucharest. Create a search tree to find a path from the initial state to the goal state using Greedy Best First Search. Generate the solution cost using the straight line distance mentioned in figure below. Is it an optimal solution? If not please write the optimal solution. 05



- (b) State the reason for increase in the popularity of data mining in the field of machine learning. 05
- (c) Explain the term mean square error, root mean square error, and mean absolute error. 05
- (d) Demonstrate that data cleansing is an important aspect for unsupervised learning. 05
- (e) Illustrate how machine learning helps in enhancing operation of wind energy systems. 05

- Q.2 (a) Describe McCulloch-Pitts Neuron Model and discuss its performance for the implementation of NOT, OR, and AND operations. 10
- (b) Why is dimensionality reduction an important issue? Describe the steps to reduce dimensionality using the principal component analysis method by clearly stating mathematical formulas used. 10

- Q.3 (a)** List different types of activation function and describe any three in brief. **10**
- (b)** Consider the following 2-D dataset in Table. Construct a SVM classifier model. Given (2,1), (2, -1), and (4, 0) as support vectors, estimate the parameters of the model and classify (4, 2). **10**

(X1, X2)	(1, -1)	(2, -1)	(5, -1)	(4, 0)	(6, 0)	(1, 1)	(2, 1)	(5, 1)
Class	C1	C1	C2	C2	C2	C1	C1	C2

- Q.4 (a)** Following dataset represents a substation working pattern for different atmospheric conditions where YES represents smooth working and NO represents that there is some fault developed in the substation. Using Naive Bayes classifier classify the substation working pattern for unseen circumstance {Sunny, Cool, High, Strong} **10**

Outlook	Temperature	Humidity	Windy	Pattern
Sunny	Hot	High	Weak	No
Sunny	Hot	High	Strong	No
Overcast	Hot	High	Weak	Yes
Rain	Mild	High	Weak	Yes
Rain	Cool	Normal	Weak	Yes
Rain	Cool	Normal	Strong	No
Overcast	Cool	Normal	Strong	Yes
Sunny	Mild	High	Weak	No
Sunny	Cool	Normal	Weak	Yes
Rain	Mild	Normal	Weak	Yes
Sunny	Mild	Normal	Strong	Yes
Overcast	Mild	High	Strong	Yes
Overcast	Hot	Normal	Weak	Yes
Rain	Mild	High	Strong	No

- (b)** Apply *k*-means algorithm in given data for *k* = 3. Use $C_1 = 2$, $C_2 = 16$, and $C_3 = 38$ as the initial cluster centers. Data {2, 4, 6, 3, 31, 12, 15, 16, 38, 35, 14, 21, 23, 25} **10**

- Q.5** (a) Discuss the challenges faced in demand side management and explain how machine learning enhances the demand side management process. **10**
- (b) Explain the decision tree? Comment on the selection of the best attribute for decision tree classifier along with examples. **10**
- Q.6** Write short notes on any **Four**
- (a) Compare informed and uninformed strategies **05**
- (b) Diversity of data: Structured and Unstructured data **05**
- (c) Perceptron training rule **05**
- (d) Deep Learning **05**
- (e) Electrical load pattern classification using machine learning **05**

[3 Hours]

[Total Marks: 80]

- Note :
1. Question 1 is compulsory
 2. Answer any three out of remaining question
 3. assume suitable data where required

Q1

- a) Explain visual design principles? **5**
- b) Explain user interface design? **5**
- c) What is cognition ?Explain cognitive processes? **5**
- d) Give differences between User experience and User Interface? **5**

Q2

- a) Explain core elements of User Experience ? **10**
- b) Sketch a wireframe for an online music store? **10**

Q3

- a) Explain Usability Testing with its types? **10**
- b) Describe the concept of prototyping and various techniques that can be used for prototyping? **10**

Q4

- a) Give the importance of feedback in improving user experience? **10**
- b) Explain how vision and sound can be used to enhance the virtual reality experience? **10**

Q5

- a) Write a short note on Virtual Reality **10**
- b) Explain Visual representation in VR **10**

Q6

- a) Create a proposal for the use of virtual reality in a journalism field that has not traditionally embraced VR technology. **10**
- b) Construct testing scenarios for ordering food with Zomato to conduct usability testing. **10**

(3 Hours)

Total Marks:80

N.B.: (1) Question No. 1 is compulsory.

(2) Attempt any three questions out of the remaining five.

1. (a) Explain the need of AI in drug discovery? **5**
(b) List of NLP applications in healthcare? **5**
(c) Explain working of personalized treatment with help of AI? **5**
(d) Explain what you understand by Electronic Health Record (EHR) and its benefits? **5**
2. (a) Explain Meta-Learning and at least one Abstract Method? **10**
(b) Explain the algorithms for: **10**
 1. Propagation and Outbreak Prediction,
 2. Automated Amblyopia Screening System
3. (a) Explain dimensionality reduction algorithms for healthcare in detail? **10**
(b) Explain multivariate testing? **10**
4. (a) Explain various evaluation metrics used in healthcare? **10**
(b) Explain high level NLP components? **10**
5. (a) Explain working Blockchain for verifying supply chain? **10**
(b) Explain Guided Search for Disease Information in detail? **10**
6. Write a short note on (Any 2) **20**
 - (a) Virtual and Augmented Reality for healthcare
 - (b) Smart Hospitals
 - (c) Use of AI and ML for Disease Risk Diagnosis from patient data
 - (d) Robot assisted surgery

Time: 3 hours

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N.B. (1) Question No. 1 is compulsory

(2) Assume suitable data if necessary

(3) Attempt any three questions from the remaining questions

Q.1 Solve any Four out of Five

20

- a. What is Natural language processing? Explain ambiguity in Natural languages with suitable examples
- b. Explain in brief inflectional and derivational morphology with suitable examples
- c. What is semantic analysis? Discuss different semantic relationships between the words
- d. What is Named-Entity recognition? Define its types
- e. What is rule base machine translation?

Q2 a. What is POS tagging? List different approaches to POS tagging. Explain one approach in brief 10

Q2 b. Discuss various stages involved in the NLP process with suitable examples 10

Q3 a. Explain with suitable examples the following relationships between word meanings: Homonymy, Polysemy, Synonymy, Hyponymy 10

Q3 b. Consider the following corpus: 10

<s> She asks you to wait patiently </s>

<s> He wants me to help him </s>

<s> They expect us to arrive early </s>

List all possible bigrams. Compute conditional probabilities and predict the next word for the word "to"

Q4 a. What is Word Sense Disambiguation? Explain dictionary-based approach to Word Sense Disambiguation 10

Q4 b. Explain Hobbs algorithm for pronoun resolution 10

Q5 a. Explain edit distance algorithm with an example. Show working of the minimum number of operations required to transform "kitten" into "sitting" 10

Q5 b. Explain Hidden Markov Model with example 10

Q.6 Write a note on (any 2) 20

- a. Information Retrieval
- b. Wordnet
- c. Syntactic and Semantic Constraints on Coreference
- d. Sentiment Analysis

Time: 03 Hours

Marks: 80

- Note:** 1. Question 1 is compulsory
2. Answer any three out of the remaining five questions.
3. Assume any suitable data wherever required and justify the same.

- Q1 a) What is Hadoop and Why it Matters. [5]
b) Compare traditional database and big data. [5]
c) Explain CAP theorem. State how it is different from ACID properties. [5]
d) Compare DBMS VS DSMS. [5]
- Q2 a) Draw Hadoop Ecosystem and briefly explain its components. [10]
b) Explain the four types of NoSQL database. [10]
- Q3 a) Explain architecture of Big data and give characteristics of it. [10]
b) Explain DGIM algorithm. [10]
- Q4 a) List the main components of Mapreduce execution pipeline. [10]
b) Explain cure algorithm. [10]
- Q5 a) What is Recommender System? Explain Types of recommender system. [10]
b) What is a Social Network? Give Varieties of Social Networks and the need for social network graph. [10]
- Q6 a) Explain with example two major classes of distance measures. [10]
b) Explain the structure of web with suitable diagram. [10]
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