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*32*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]**

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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]**

Time: 3 hours **Max. Marks: 80**

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 any 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

(3 Hours) **(Total Marks: 80)**

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

2. Answer any three out of the remaining questions.

3. Assume suitable data if necessary.

4. Figures to the right indicate full marks.

Q1. Attempt the following (any 4): (20)

a. What is distributed ledger? Explain its need in the Blockchain.

b. What is Bitcoin? Explain the role of hash cash.

c. List and explain different types of accounts in ethereum.

d. Explain the need of private blockchain.

e Differentiate between ERC20 and ERC721.

Q2. Attempt the following:

a. What Merkle root tree. Explain Pectricia Merkle root in ethereum. (10)

b. Explain the process of mining in detail. (10)

Q3. Attempt the following:

a. Write a smart contract in solidity to explain various types of arrays. (10)

b. Explain Hyperledger Fabric in detail. (10)

Q4. Attempt the following:

a. Explain the benefits and limitation s of blockchain. (10)

b. Describe the various types of consensus in blockchain. (10)

Q5. Attempt the following:

a. Explain ethereum components in detail? (10)

b. Explain Different types of cryptocurrencies in detail. (10)

Q6. Write short notes on (any 2): (20)

a. Case study on any Blockchain platform

b. Consensus in private blockchain

c. Blockchain in Defi and Metaverse

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Time: 3 hours Max. Marks: 80

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

Q1. Attempt any four. 20

a. List and describe the essential elements of a game in the context of game theory

b. Compare non-cooperative games with cooperative games.

c. Explain the significance of the discount factor in the context of repeated games. How does it affect the players' strategies and outcomes over multiple rounds?

d. Define what is meant by "mechanism design" in the context of aggregating preferences.

e. What do you mean by bargaining in context of game theory.

Q2.a) Write two real-world applications of game theory and explain how it has been used to analyze strategic decision-making in those contexts. 20

b) Explain in detail the prisoner's dilemma (PD) with payoff matrix and with suitable examples.

Q3.a) Define Bayesian Nash Equilibrium and find the value of p according to BNE in below given payoff matrices. 20

a type = p

	Left	Right
Up	3, 4	1, 0
Down	4, 3	2, 0

b type = 1-p

	Left	Right
Up	6, 2	0, 4
Down	5, 1	-1, 4

b) Refer the below payoff matrix and identify the strategic game involved in it and describe it in brief.

	Head	*Tail*
Head	$1, -1$	$-1, \ 1$
Tail	$-1, \ 1$	$1, -1$

Q4 a) Explain zero sum games in non-cooperative games 20

b) Discuss the concept of optimality and concept of Pareto efficiency in the context of game theory.

Q5.a) Explain subgame perfect Nash equilibrium in game theory 20

b) What do you mean games with Perfect Information and games with imperfect information. Explain with examples.

Q6. Write short note on any **two** 20

a) VCG mechanisms.

b) Repeated Games

c) Computing Solution Concepts of Normal – Form Games

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Duration: 3hrs **[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 the challenges faced by Knowledge management in different business scenarios.

b Identify the five factors that contribute to the increasing vulnerability of information resources, and provide a specific example of each one?

c Analyze the impact of BI on Decision making.

d Explain the applications of computer networks.

e Explain the importance of Information systems to Society.

2 **a** Develop the plan for delivery application in M-commerce using social computing. **[10]**

b Explain Data warehouse and Data Mart in an organization. **[10]**

3 **a** Explain the major security threats to information security and discuss the measures for controlling the same. **[10]**

b Explain CRM. Describe the different types of CRM with example. **[10]**

4 **a** What is Cloud Computing? Explain its models. **[10]**

b Write note on e-business. **[10]**

5 **a** Identify the measures to improve cyber security with example. **[10]**

b Explain the phases of the system development lifecycle with example. **[10]**

6 **a** Explain the steps involved in knowledge capturing. **[10]**

b Compare and contrast Web 1.O,2. O,3. O with example. **[10]**

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(3 hrs.) **Maximum Marks = 80**

NB: 1. Question No. 1 is compulsory and solve any THREE questions from remaining questions

2. Assume suitable data if necessary

3. Draw clean and neat diagrams

Q1. a. Explain Hyperledger sawtooth. [05 Marks]

b. Explain uses and limitations of python in blockchain. [05 Marks]

c. Describe the features in Ethereum that are not available in Bitcoin. Also discuss what is Whisper and Swarm. [05 Marks]

d. What are the best practices for blockchain dApp Testing [05 Marks]

Q2 a. Describe each Component of Ethereum. [10 Marks]

b. With a neat diagram explain the components of the dApp architecture. [10 Marks]

Q 3. a. Explain built in and user defined functions in solidity with example. [10 Marks]

b. Explain Chaincodes For Developers and Operators In Blockchain [10 Marks]

Q 4. a. With a neat diagram explain Transaction Flow in Hyperledger Fabric [10 Marks]

b. What is Decentralized Autonomous Organization? Discuss its benefits and limitations. [10 Marks]

Q 5. a. Explain ERC20 token standard with its functions. Compare how ERC721 tokens are different than ERC20 tokens. [10 Marks]

b. Explain contract inheritance and modifiers in solidity with example. [10 Marks]

Q .6. a. Explain use of blockchain for Supply Chain Management. [10 Marks]

b. Describe IPFS with reference to file storage in Blockchain. [10 Marks]

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Time: (3 Hours) **[Total Marks: 80]**

N.B.: (1) Question **No.1** is **Compulsory**.
(2) Attempt **any three** questions from the **remaining** questions.
(3) Assume **suitable** data wherever required but **justify** the same.
(4) **Figures** to the **right** indicate **full marks**.
(5) Answer to each new question must start on a **fresh page**.

1.	(a)	What type of data analytics is used in healthcare?	**[5]**
	(b)	Which imaging technologies do not use radiation? Explain those technologies in brief.	**[5]**
	(c)	What you mean by the term Natural Language Processing for clinical/medical text data.	**[5]**
	(d)	Define Advanced Data Analytics for Healthcare with six real-world applications.	**[5]**
2.	(a)	Define Phenotyping Algorithms with key aspects.	**[10]**
	(b)	What is visualization? Explain different types of visualization techniques, tools with advantages and disadvantages.	**[10]**
3.	(a)	Illustrate Predictive Modelling in Healthcare with at least two examples.	**[10]**
	(b)	Describe the following: -	**[10]**

1. BAN
2. Dense/Mesh area network for smart living environment
3. Senor Technology
4. Image Registration
5. Feature Extraction

4.	(a)	What are the components of EHR? What are the barriers for adopting EHR?	**[10]**
	(b)	Explain types of Fraud detection in healthcare with the help of example.	**[10]**
5.	(a)	What are the challenges one may face while processing Covid clinical reports?	**[10]**
	(b)	Define Data science with applications of healthcare data analytics.	**[10]**
6.	(a)	How will we analyze Mental health status of someone using their tweets on twitter?	**[10]**
	(b)	Define Biomedical Imaging Modalities with their Applications.	**[10]**

Duration: 3hrs **[Max Marks: 80]**

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

1. Attempt **any FOUR** **[20]**
   a. Discuss CIA Triad in Information Security.
   b. Explain concept of High Availability.
   c. Illustrate various XSS attacks
   d. Explain Information Security issues in Cloud computing
   e. Explain various threats to Access Control.

2. a. Describe Risk assessment techniques outlined in ISO31010 framework. **[10]**
b. Define Intrusion Detection System. Explain in detail IDS techniques. **[10]**

3. a. Explain Availability, Mean Time Between Failure (MTBF), Mean Time to Repair (MTTR), and Calculate the Availability for a product has MTBF of 200hrs and MTTR of 10 hrs. **[10]**
b. Explain in detail COBIT Framework. **[10]**

4. a. Describe various Disaster Recovery Techniques. **[10]**
b. Explain any two different Access Control Models from the following. **[10]**
   a. Discretionary,
   b. Mandatory,
   c. Role based
   d. Rule-based.

5. a. Compare the quantitative and qualitative risk assessment approaches. **[10]**
b. Explain various types of Audits in Windows Environment. **[10]**

6. a. What are the key characteristics of OCTAVE approach? **[10]**
b. What are the objectives of IT ACT? Explain in detail IT ACT 2000 and IT ACT 2008. **[10]**