**Time:3 Hours** **Marks: 80**

N.B.: 1) Question No. 1 is compulsory.
2) Answer any three out of remaining questions.
3) Assume suitable data if necessary.
4) Figures to the right indicate full marks.

Q1. (a)List down the applications of NLP in Healthcare. (5)
Q1. (b) Illustrate Knowledge Discovery Process in healthcare with a neat diagram. (5)
Q1. c) Explain why AI is called as multifaceted discipline. (5)
Q1. (d) Explain Robot assisted surgery. (5)

Q2. (a) Explain Multi classifier Decision Fusion. (10)
Q2. (b) Differentiate Model parameters from Hyperparameters. Demonstrate Grid search & Random search hyperparameter tuning algorithms with example. (10)

Q3. (a) Explain low level NLP components with suitable example. (10)
Q3. (b) Outline the structure of Explainable AI (XAI) and explain its advantage over traditional AI models. (10)

Q4. (a) Explain the Use Case "Evidence based Medicine" and "Personalized Medicine". (10)
Q4. (b) How does blockchain technology contribute to the healthcare sector? Explain with suitable examples. (10)

Q5. (a) Cancer is a leading cause of death globally. It can be cured if detected early. For this, an AI model has been created to predict whether or not there is a chance of disease. The confusion matrix for the model is given below in Table 1 (10)

Table 1: Confusion Matrix

| | | Actual Values: 1 | Actual Values: 0 |
|---|---|---|---|
| Predicted Values | 1 | 540 | 150 |
| | 0 | 110 | 200 |

Based on this confusion matrix, calculate the following:

- Accuracy
- Precision
- Recall (Sensitivity)
- F1-score

Define the terms: Accuracy, Precision, Recall and f1-score.

Q5. (b) Define Intelligent Personal Health Record (iPHR). List and explain in brief the functions provided by iPHR for users in managing their health information effectively? (10)

Q6. Explain any Two: (20)
a) Deep Learning
b) Evolutionary Algorithm
c) Ensemble Learning

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**(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. Define blockchain. Compare different types of blockchain.

b. State and explain various mining pool methods.

c. What is a Bitcoin script? Explain pay-to-public-key-hash (P2PKH) scripts with a suitable example.

d. How is swarm different from whisper?

e. Write a program in solidity to check whether an entered number is a palindrome.

**Q2. Attempt the following:**

a. With a suitable diagram, explain the structure of a block header with a list of transactions. (10)

b. Compare Bitcoin and Ethereum. How to calculate mining difficulty in Bitcoin? (10)

**Q3. Attempt the following:**

a. Describe the architecture of Ethereum. (10)

b. Explain fixed and dynamic arrays in solidity with suitable examples. (10)

**Q4. Attempt the following:**

a. Elaborate on RAFT consensus mechanism. (10)

b. Write and elaborate a code in solidity to explain visibility and activity qualifiers. (10)

**Q5. Attempt the following:**

a. Distinguish between altcoins, utility tokens and security tokens. (10)

b. Describe Byzantine fault tolerant (BFT) algorithm. (10)

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

a. ERC20 and ERC721

b. UTXO model of Bitcoin

c. Corda

d. Blockchain in supply chain management

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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 Write short notes on: **[20]**
a) Big Data and its characteristics
b) Distance measures for Big Data
c) The Map and Reduce Tasks
d) Bloom filter for stream data mining

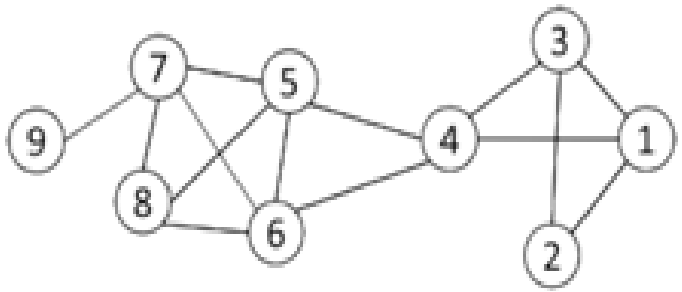
Q2 a) Explain HDFS architecture. **[10]**
b) Explain Column family store and Graph Store NoSQL architectural pattern with example. **[10]**

Q3 a) Write a Map reduce pseudo code to multiply two matrices. Illustrate with an example showing all the steps. **[10]**
b) Explain Issues in Data stream query processing **[10]**

Q4 a) List the main components of Map reduce execution pipeline. **[10]**
b) Explain DGIM algorithm. **[10]**

Q5 a) Explain Collaborative filtering system. How is it different from content based system . **[10]**

b) What is clique percolation method Write an algorithm on (CPM). **[10]**
Also show how the CPM finds clique for the following graph. Explain with steps.

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Q6 a) Explain PageRank algorithm. **[10]**
b) Explain CURE algorithm. **[10]**

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

**(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)** | What are Feed Forward Neural Network? | |
| | **b)** | Explain Gradient Descent in Deep Learning. | |
| | **c)** | Explain the dropout method and it's advantages. | |
| | **d)** | What are Undercomplete Autoencoders? | |
| | **e)** | Explain Pooling operation in CNN. | |
| **2** | **a)** | What are the Three Classes of Deep Learning, explain each? | **[10]** |
| | **b)** | Explain the architecture of CNN with the help of a diagram. | **[10]** |
| **3** | **a)** | What are the different types of Gradient Descent methods, explain any three of them. | **[10]** |
| | **b)** | Explain main components of an Autoencoder and it's architecture. | **[10]** |
| **4** | **a)** | Explain LSTM model, how it overcomes the limitation of RNN. | **[10]** |
| | **b)** | What are the issues faced by Vanilla GAN models? | **[10]** |
| **5** | **a)** | What are L1 and L2 regularization methods? | **[10]** |
| | **b)** | Explain any three types of Autoencoders. | **[10]** |
| **6** | **a)** | What is the significance of Activation Functions in Neural Networks, explain different types Activation functions used in NN. | **[10]** |
| | **b)** | What are Generative Adversarial Networks, comment on it's applications. | **[10]** |

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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. Explain the difference between strategies, preferences and payoffs in game theory.

b. What is a Bayesian game? Illustrate with an example.

c. Describe the differences between zero-sum and non-zero-sum games with suitable examples.

d. Explain the concept of Pareto efficiency in game theory.

e. How is the concept of utility used in game theory? Explain with an example.

f. Describe how the discount factor (δ) affects the players' preferences for current versus future payoffs in infinitely repeated games.

Q2.a) Consider a game with the following payoff matrix for Player A and Player B: **(20)**

| | B1 | B2 |
|---|---|---|
| A1 | 4,2 | 3,3 |
| A2 | 2,3 | 1,4 |

i. Identify the Nash Equilibrium,if any.
ii. Discuss whether this game has a dominant strategy for any player.

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

Q3. a) Explain typical application areas for game theory with proper examples. **(20)**

b) Explain the Vickrey-Clarke-Groves (VCG) mechanism with an example.

Q4 a) Explain the concept of mixed strategy equilibrium. How does it differ from pure strategy equilibrium? Illustrate with an example. **(20)**

b) What is a sequential game? How does it differ from a simultaneous game?

Q5.a) What is Mechanism Design in game theory? Discuss its importance in economics, data science or any domain. **(20)**

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

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

a) Computing Solution Concepts of Normal – Form Games

b) Bertrand and Cournot models of oligopoly.

c) Repeated Games

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**Duration: 3hrs** **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 | List the various components of CBIS. | [5] |
| | b | What are the features of Executive Support System? | [5] |
| | c | Define Information security with an example. | [5] |
| | d | Are Blogs and Wikis different? Justify with application of each. | [5] |
| | e | How is E-commerce supported by MIS? Give one case to describe same. | [5] |
| 2 | a | Highlight the Economic impacts of IS. Give example. | [10] |
| | b | What do you mean by CAAS, SAAS, IASS ? Give the application of each of these. | [10] |
| 3 | a | Contrast to bring out the advantages and disadvantages of Completive environment in an organization. | [10] |
| | b | Discuss how privacy issue can impact transborder data flows? | [10] |
| 4 | a | What are types IS? Explain with example. | [10] |
| | b | Identify advantages and drawbacks of businesses implementation which uses an enterprise resource planning system. | [10] |
| 5 | a | Briefly describe the risks of social computing to business giving suitable examples. | [10] |
| | b | Is security an ethical responsibility? Justify with a case study. | [10] |
| 6 | a | Analyze the key benefits of cloud computing | [10] |
| | b | How the quality of data is ensured in an organization? | [10] |

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**Time: 3 hour** **Total Marks: 80**

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

**2. Attempt any three questions from remaining five questions**

**3. Assume suitable data if necessary and justify the assumptions**

**4. Figures to the right indicate full marks**

| | | | |
|---|---|---|---|
| Q1 | | **Answer the Following.** | 20 |
| | A | Compare derivational and inflectional morphology with suitable example | 05 |
| | B | Discuss various challenges in processing natural language. | 05 |
| | C | Discuss Information Retrieval vs Information Extraction in detail | 05 |
| | D | What do you mean by word sense disambiguation (WSD)? Explain machine learning based (Naive based) approach for WSD. | 05 |
| Q2 | A | Write a note on Syntactic and Semantic Constraints on Coreference. | 10 |
| | B | Explain Porter's Stemming algorithm with example. | 10 |
| Q3 | A | Explain with suitable example following relationships between word meanings: Homonymy, Polysemy, Synonymy, Antonymy, Hypernomy, Hyponomy, Meronomy. | 10 |
| | B | What is Natural language processing (NLP)? Discuss various stages involved in NLP process with suitable example. | 10 |

[TURN OVER]

Q4 A Explain N-gram model with example. 10

B Explain in detail Stochastic (HMM) tagging. 10

Q5 A Consider following Training data: 10

<s> I am Sam </s>

<s> Sam I am </s>

<s> Sam I like </s>

<s> Sam I do like </s>

<s> do I like Sam </s>

Assume that we use a bigram language model based on the above training data. What is the most probable next word predicted by the model for the following word sequences?

(1) <s> Sam ...

(2) <s> Sam I do ...

(3) <s> Sam I am Sam ...

(4) <s> do I like ...

B What is parsing? Explain types of parsing in NLP. 10

Q6 Write Short Notes.(5 marks each) 20

a) Named Entity Recognition

b) Wordnet

c) Reference Resolution problem

d) Machine Translation

**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. Explain basic principles of confidentiality & integrity.
   b. Illustrate password vulnerabilities.
   c. Describe End point protection in web application security.
   d. Compare the IDS and IPS with various parameters.
   e. Differentiate between a Hot Site, Warm Site, and Cold Site for facility recovery in disaster recovery.

2. a . Describe various Access Control techniques. [10]
   b. What are the objectives of IT ACT? Explain in detail IT ACT 2000 and IT ACT 2008. [10]

3. a. Enlist OWASP top ten Vulnerabilities and explain any three in detail? [10]
   b. Describe cloud computing. Write the benefits and issues related to information security. [10]

4. a. Describe Risk assessment techniques outlined in ISO31010 framework [10]
   b. Summarize Various Audits in Windows Environment and explain it. [10]

5. 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 details Policies, Procedures and Guidelines of Information Security? [10]

6. a. Apply the concept of vulnerability to any real time application. Differentiate between threat, vulnerability & risk? [10]
   b. Define XSS attack and explain how it can be used to manipulate a web application with example? [10]

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