

**Time: 03 Hours****Marks: 80****Note:** 1. Question 1 is compulsory

2. Answer any three out of remaining questions.
3. Assume suitable data wherever required and justify the same.

- Q1 a) Describe how logistic regression can be used as a classifier. [5]  
 b) Explain the ethical issues in data science. [5]  
 c) State differences between LDA and PCA. [5]  
 d) What is sharding? Explain the advantages of sharding. [5]
- Q2 a) Describe the six steps of data science process. [10]  
 b) Describe the working of the Map-Reduce with an example. [10]
- Q3 a) Explain Gaussian (normal) distribution with respect to pdf and cdf and its use in statistics. [10]  
 b) Given  $S = \begin{bmatrix} 0 & 0 \\ -1 & -1 \\ 1 & 2 \end{bmatrix}$  [10]  
 Find principal components.
- Q4 a) What is type I and type II errors in hypothesis testing? Is one always more serious than the other? Why? [10]  
 b) Explain the process of content based RS with suitable example. [10]
- Q5 a) Explain singular value decomposition (SVD) with an example. [10]  
 b) What is No SQL? Compare No SQL with SQL. [10]
- Q6 a) Explain Independent Component Analysis (ICA) in descriptive modeling. [10]  
 b) What is gradient descent algorithm and how it helps in minimizing the cost function. [10]

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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 five questions.

(3) Make suitable assumptions wherever necessary but justify your assumptions.

- 1 (a) Explain in details Need and types of Reconnaissance 05  
 (b) What are the different ways to recover deleted files from a Unix system? 05  
 (c) Discuss the Guidelines for Writing a Report. 05  
 (d) What is the need of digital Forensics? 05
- 2 (a) Why is ethical hacking necessary? Explain the steps of ethical hacking in detail. 10  
 (b) Explain in details computer forensics methodologies? 10
- 3 (a) List & Explain different challenges in live evidence handling. 10  
 (b) Explain in detail about Incident Response Methodology and the steps associated with it 10
- 4 (a) List the evidences present in memory card. Elaborate the procedure for collecting evidences 10  
 in present in memory card.  
 (b) ) Explain goal of resolution along with the step taken to resolve computer 10  
 security incident.
- 5 (a) ) Explain in details what is need of live response ? Discuss different types of host base live 10  
 response technique.  
 (b) Explain Role of Metasploit during Ethical Hacking 10
- 6 Write a short note on: (any two) 20  
 .  
 (a) Ethics in Digital Forensics.  
 (b) E-mail Forensics.  
 (c) Data Collections forensics Tools : WinHex.

(Time: 3 Hours)

[Total Marks 80]

N. B:

1. Question No. 1 is Compulsory.
2. Solve any THREE from Question No. 2 to 6.
3. Draw neat well labeled diagram wherever necessary.

- Q. 1 a) What are the applications of parallel computing? (5)
- b) What are the principles of Message Passing Programming. (5)
- c) Explain Non-Blocking Communication using MPI. (5)
- d) Explain the cube Interconnection networks. (5)
- Q. 2 a) Write a MPI program for prime number generation. (10)
- b) What is a Data Race? Why Data-Races are Undesired? How Data-Races Can be Prevented? (10)
- Q. 3 a) Short note on 'SIMD matrix multiplication'. (10)
- b) Explain SIMD, MIMD and SIMT architecture. (10)
- Q. 4 a) With neat block diagram explain in detail about the various programmatic levels of parallel processing. (10)
- b) State Amdahl's law?  
Suppose a serial program reads  $n$  data from a file, performs some computation, and then writes  $n$  data back out to another file. The I/O time is measured and found to be  $4500 + n$   $\mu$ sec. If the computation portion takes  $n/200$   $\mu$ sec, what is the maximum speedup we can expect when  $n=10,000$  and  $p$  processors are used? (10)
- Q. 5 a) Explain in brief Quantum Computers. (10)
- b) What are the different Performance metrics. (10)
- Q. 6 Solve any FOUR:
1. Write a short note on data flow model.
  2. Explain Granularity, Concurrency and dependency graph.
  3. Explain Various techniques in decomposition. (20)
  4. What is meant by grain packing and scheduling in parallel Processing.
  5. What are the characteristic of tasks and interactions?

(3 hours)

Total Marks: 80

- N.B. 1. Question **No. 1** is compulsory  
 2. Attempt any **three** out of remaining  
 3. Assume suitable data if **necessary** and justify the assumptions  
 4. Figures to the **right** indicate full marks

- Q1 A Differentiate Hard Computing Techniques with soft computing. 05  
 B Briefly discuss three classes of deep learning network. 05  
 C Identify key difference following unsupervised learning techniques: ART and SOM, 05  
 D Determine the similarities and differences between MLP model with RBFN. 05

- Q2 A For a given Information System I(U,A),  
 Assume  $B = \{ \text{Age, LEMS} \}$ , Determine w.r.t  
 Rough sets  $W = \{ y | \text{can walk}(y) = \text{Yes} \}$

	Age	LEMS	Can Walk
x1	16-30	50	yes
x2	16-30	0	no
x3	31-45	1-25	no
x4	31-45	1-25	yes
x5	46-60	26-49	no
x6	16-30	26-49	yes
x7	46-60	26-49	no

1.  $IND_{Age}(U)$  and  $IND_{LEMS}(U)$   
 2.  $B = \text{lower Approximation} = W : BW$   
 3.  $B = \text{upper approximation} = BW$   
 4.  $B = \text{boundary region} = BNB(W)$   
 5.  $B = \text{outside region} = U - BW$
- B Differentiate Self Organizing MAP and Learning Vector Quantization algorithm. 08

- Q3 A Design a Fuzzy Controller for the following Control Process. 20  
 It is required to control Boiler Water Level based on the values of two input sensors namely Temperature and Vapor Pressure.  
 Assume three descriptors for each input parameter and five for control variable.  
 Assume the range of Temperature 0-100°C and the range of Vapor Pressure is 0-100kPascal.  
 Note that Required water level is inversely proportional to vapor pressure and is directly proportional to temperature.  
 Define all membership functions for each descriptor, Create Rule-base in Cross-tab form.  
 For following Crisp input for Vapor Pressure 65 kPascal and the temperature is 45°C, how much water level is required to be maintained.

- Q4 A Show iterations of perceptron learning for AND gate implementation, assume bias 10  
 input  $X_0 = 1$  with initial weight vector as  $W = [ 0 \ 0 \ 0 ]$  Use binary bipolar input for the truth table.  
 B Discuss Principles of Adaptive Resonance theory. 10

- Q5 A For following Fuzzy set, 10  
 $A = \{0.5/p + 0.8/q\}$ ,  $B = \{0.3/a + 0.8/b + 0.9/c\}$ ,  $C = \{0.7/m + 0.4/n\}$ , Find:  
 a.  $A \times B$ , b.  $B \times C$  c.  $A \circ C$
- B Show one iteration of Kohanan's SOM to cluster the following data into two clusters. 10  
 $P1_t = [0.2 \ 0.8]$ ,  $P2_t = [1 \ 0.1]$ ,  $P3_t = [0.1 \ 1.0]$ ,  $P4_t = [0.9 \ 0.2]$   
 Initial weight vectors are  $W_1^t = [0.1 \ -0.1]$ ,  $W_2^t = [-0.1 \ -0.1]$   
 Show the architecture of SOM (i.e. input and output neurons required in each layer)  
 Assume neighborhood= 1.
- Q6 Solve any two.
- A Explain Generalized Modens Ponens used in Fuzzy System with examples. 10  
 B Explain Error back propagation algorithm with neat diagram and show clearly the mathematical formulae for weight adjustment at each layer. 10  
 C Describe Automobile Fuel Efficiency using ANFIS 10

(Time: 3 Hours)

Total Marks:80

(1) Ques 1. is compulsory.

(2) Attempt any 3 of the remaining 5 questions.

Q1 (a) What is AI? List down all components of AI. (04)

(b) Explain the limitations of Propositional logic with suitable example. (04)

(c) Describe the Bayes theorem. (04)

(d) Explain any AI problem with suitable example. (04)

(e) Solve the given crypt arithmetic puzzle: (04)

BASE  
+ BALL  
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GAMES  
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Q2. a) Explain Hill Climbing and Simulated Annealing with suitable example. (10)

b) Explain Goal Based and Utility based agent with block diagram. (10)

Q3. a) What is Prolog? What do you mean by Structure in Prolog? (10)  
Write a Prolog Program for family information systems.

b) What is heuristic function? Explain 8 puzzle problem. (10)  
Explain the PEAS descriptor of Wumpus world problem.

Q4. a) Consider the following sentence (10)

(i) Mammals drink water.

(ii) Man is Mortal.

(iii) Man is Mammal.

(iv) Bob is Man.

Prove *Bob is Mortal* using modus ponens & Resolution.

b) Differentiate between Informed and Uninformed search techniques. Also explain A\* algorithm with suitable example. (10)

- Q5. a) Explain Planning in AI. Compare and contrast between Partial Order Planning and Conditional Planning. Also explain the real time application of hierarchical planning. (10)**
- b) What is uncertainty ? Explain Bayesian Network with example. (10)**

**Q6. Attempt any 4 :**

- a) Backward chaining with an example. (05)**
- b) Expert Shell system architecture. (05)**
- c) Conditional Probability. (05)**
- d) Knowledge base agent. (05)**
- e) Depth limited search. (05)**
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