AIML 379 / LLB

Roll No. ..... Total Pages : 3

43228

BT-3/D-24

APPLIED STATISTICAL ANALYSIS FOR AI

Paper : BS-CS-AIML-201A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions.

1. (a) What is statistics and explain statistics in our everyday.

(b) Draw the histogram and frequency polygon for the following distribution.

Class interval	Frequency
0-99	10
100-199	54
200-299	184
300-399	264
400-499	246
500-599	40
600-699	1
700-799	1

2. Explain in detail :

(i) Population.

(ii) Sample.

(iii) Types of sampling.

(iv) Sampling classification.

(v) Graphical representation of data.

3. The monthly rents for 8 one-bedroom apartments located in one area of the city, are

625 740 805 670 705 740 870 850

(a) Calculate the sample variance.

(b) The sample standard deviation.

4. (a) Find the value of the standard-deviation from the following data :

Marks	No. of students
0-10	5
10-20	10
20-30	20
30-40	40
40-50	30
50-60	20
60-70	10
70-80	04

(b) Find the mean, variance, and standard deviation of the number of heads in three tossed of a coin.

5. (a) A coin was tossed 100 times under identical conditions independently yielding 30 heads and 70 tails. Test at 1% level of significance whether the coin is unbiased.

(b) A random sample of 900 members has a mean of 3.4 cms. Can it be reasonably regarded as a sample from a large population of mean 3.2 cms and S.D. 2.3 cms?

6. (a) The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0 cm respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5 cm.

(b) Explain the analysis of variance (ANOVA). Distinguish between one-way and twoway ANOVA techniques.

7. Calculate Karl Pearson's coefficient of correlation between the marks in Mathematics and Physics obtained by 10 students :

Marks in Mathematics	9	8	6	5	10	6	4	3	2	1
Marks in Physics	8	10	9	7	5	6	2	0	1	1

8. Find the coefficient of rank correlation, if the rank order of each of the two members is given below :

Rank order by x	1	6	5	10	3	2	4	9	7	8
Rank order by y	3	5	8	4	7	10	2	1	6	9

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43229

BT-3/D-24

DATA STRUCTURE

Paper : ES-CS-AIML-203A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT–I

1. (a) Explain different types of data structures, distinguishing between built-in and userdefined types, and discuss their applications. (7)

(b) Describe binary searching algorithm using suitable example? (8)

2. Explain time and space complexities with examples. Define Big O, Big Omega, and Big Theta notations and their importance in algorithm analysis. (15)

UNIT–II

3. (a) Discuss the quick sort algorithm in detail, including its steps and partitioning process, with an example. (8)

(b) Describe priority queues and their applications. Explain how a priority queue can be implemented? (7)

4. (a) Explain the use of associativity in infix evaluation. Give examples of how left-to-right and right-to-left associativity impact the result. (8)

(b) Explain the concept of stack overflow and underflow. How are these conditions detected and handled in stack implementations? (7)

UNIT–III

5. (a) What is a doubly linked list? Discuss how to implement insertion and deletion operations on it? (8)

(b) Discuss the differences between static and dynamic implementations of linked list. (7)

6. Describe how linked list are used to implement stacks and queues. Highlight the key benefits and limitations of using linked list for these data structures. (15)

UNIT–IV

7. (a) Explain AVL trees and discuss how they maintain balance? Why is balancing important in tree data structures? (8)

(b) Explain the concept of a binary tree traversal, covering in-order, pre-order, and post-order traversals with examples. (7)

8. Explain graph traversal algorithms (Breadth-First Search and Depth-First Search) with examples. Compare their applications. (15)

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43330

BT-3/D-24

OBJECT ORIENTED PROGRAMMING

Paper : PC-CS-AIML-205A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit.

UNIT–I

1. (a) Define encapsulation in the context of Object-Oriented Programming. Discuss its significance in software development. (8)

   (b) Differentiate between static polymorphism and dynamic polymorphism with relevant examples. (7)

2. (a) What is an abstract class? Explain with an example how it is used in C++. (10)

   (b) What are namespaces in C++? Discuss how they help in avoiding name collisions. (5)

UNIT–II

3. (a) What are access specifiers in C++? Explain the access levels of public, private, and protected members in inheritance with examples. (8)

   (b) Discuss the role of friend functions in C++. Write a C++ program demonstrating a friend class accessing private members. (7)

4. (a) Explain the concepts of constructors and destructors in relation to multiple inheritance. (7)

(b) Describe dynamic memory management in C++. How do the new and delete operators function? (8)

UNIT–III

5. (a) What is Operator overloading? Write a program in C++ to overload the * operator. (10)

(b) Under what circumstances overloading using friend function becomes necessary. (5)

6. (a) Explain the concept of Virtual function. Why is it necessary? (7)

(b) What is a pure virtual function? Discuss its role in creating interfaces in C++. (8)

UNIT–IV

7. (a) Define exceptions in C++. Illustrate the exception handling mechanism using try, catch, and throw blocks with an example. (8)

(b) Write a class template for a stack data structure, including methods for push, pop, and displaying the stack contents. (7)

8. Write short note on :

(a) Explain sequential and random file operations.

(b) Rethrowing an exception

(c) Exception and Inheritance. (15)

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43331

BT-3/D-24

INTRODUCTION TO AI

Paper–PC-CS-AIML-207A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions by selecting at least *one* question from each unit.

UNIT–I

1. (i) Explain the role of multi agents in AI. (8)

   (ii) Discuss the history of AI. (7)

2. (i) What are different components of natural language processing? How NLP is used with AI. (8)

   (ii) Discuss case study on Google Duplex. (7)

UNIT–II

3. (i) Explain the concept of alpha-beta pruning. Write alpha-beta search algorithm. (8)

   (ii) Discuss case study on health care system. (7)

4. Write short notes on :

(i) Optimization Search.

(ii) Adversarial Search. (2×7½=15)

UNIT–III

5. (i) Explain different types of ontology knowledge models. (7)

(ii) Distinguish prepositional logic and predicate logic. Write backward chaining algorithm. (8)

6. (i) Discuss the role of AI in Medical diagnosis with example. (7)

(ii) Differentiate Bayesian and temporal reasoning with example. (8)

UNIT–IV

7. (i) Discuss the significance of AI in creativity. (7)

(ii) Discuss the role of AI in autonomous vehicle. (8)

8. (i) What do you mean by chatbot. How AI plays an important role in chatbot. (8)

(ii) Explain the role of AI in finance. (7)

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43332

BT-3/D-24

PROGRAMMING LANGUAGE

Paper : EC-CS-AIML-209A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit.

UNIT–I

1. (i) Explain the role of different elementary data type in programming language. 7

   (ii) Write short note on attribute grammar dynamic semantic. 8

2. (i) Discuss various methods of type checking and type conversion. 7

   (ii) Differentiate the working of interpreter and compiler with example. List the languages having interpreter and compiler. 8

UNIT–II

3. (i) Discuss various methods of declaration and type checking of data structure in programming. Explain the usage of these with example. 8

(ii) Differentiate overloaded subprogram and generic subprogram. 7

4. (i) Discuss various methods of data hiding. 7

(ii) Differentiate union and structure with example. 8

UNIT–III

5. (i) Differentiate explicit and implicit sequence control with example. 7

(ii) Discuss the design issues of subprogram and its operations performed on them. 8

6. (i) What do you mean by exception? Discuss various methods to handle exceptions. 8

(ii) Discuss various parameter transmission schemes? 7

UNIT–IV

7. (i) Differentiate logical, procedural and object oriented languages with example. 7

(ii) Compare C and C++ programming language with example. 8

8. (i) Discuss various phases in system controlled storage management. 7

(ii) Distinguish stack based storage management and heap storage management. 8

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43333

BT-3/D-24

BUSINESS INTELLIGENCE AND ENTREPRENEURSHIP

Paper–HM-902A

Time : Three Hours] [Maximum Marks : 75

Note : The students will be required to attempt *five* questions, selecting at least *one* from each unit.

UNIT–I

1. How do economic and non-economic factors influence entrepreneurial growth, and what strategies can be adopted to overcome challenges?

2. What are the critical components of Entrepreneurial Development Programs (EDPs), and how do they foster entrepreneurial competencies?

UNIT–II

3. What are the essential criteria for selecting a business product, and how can feasibility studies and competitor analysis inform the decision-making process?

4. How can entrepreneurs design and implement a comprehensive marketing plan that includes market research, segmentation, and the marketing mix?

UNIT–III

5. What are the primary challenges faced by Small Scale Industries (SSI) and MSMEs, and how can these be mitigated through government schemes and policies?

6. How does the process of SSI registration and obtaining an NOC from pollution boards impact the launch of a small enterprise?

UNIT–IV

7. What is the role of institutions like SIDBI, NSIC, and DIC in supporting the establishment and growth of small businesses in India?

8. Why are Intellectual Property Rights (IPR) critical for entrepreneurs, and how do patents, copyrights, and trademarks safeguard business innovations?

AIML 5th/ Lib

Roll No. ..... Total Pages : 02

BT-5/D-24 **45273**

AUTOMATA

PC-CS-AIML-301A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Explain the applications of finite Automata. 8

   (b) Discuss finite automata with Epsilon transitions. 7

2. (a) Describe the Algebraic laws of Regular Expressions. 8

   (b) Discuss Equivalence and Minimization of NFA and DFA automata. 7

Unit II

3. (a) Explain applications of Context free Grammer. 8

   (b) Discuss applications of pumping lemma. 7

4. Explain the following terms : 15

   (a) Chomsky Normal form

   (b) Greibach Normal form.

Unit III

5. Explain Equivalence of Moore and Mealey machines and its designing. **15**

6. (a) Discuss Push Down Automata. **8**

   (b) Discuss the Equivalence of PDA's and CFG's. **7**

Unit IV

7. (a) Explain Rice's Theorem. **8**

   (b) Write a short note on Restricted Turing Machines. **7**

8. Describe the Universal Turing Machines and designing of Turing Machines. **15**

Roll No. ..... Total Pages : 03

BT-5/D-24 45274

DESIGN AND ANALYSIS OF ALGORITHMS
PC-CS-AIML-303A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) What is a priority queue ? Explain the difference between a max-priority queue and a min-priority queue.

   (b) Differentiate between O-notation, Ω-notation, and Θ-notation using suitable examples.

2. (a) What is the quick sort algorithm ? What are the average and worst-case time complexities of quick sort ?

   (b) Describe the main idea behind Strassen's algorithm for matrix multiplication. How does it differ from the traditional matrix multiplication method ?

Unit II

3. (a) What are the two essential characteristics a problem must have to be solved using dynamic programming ? Explain with examples.

   (b) What is a Red-Black Tree ? Explain the process of inserting a node into a Red-Black Tree.

4. (a) Discuss, how Huffman coding works and why a greedy approach is appropriate for this data compression technique ?

   (b) What is Fibonacci heap ? What are the primary operations supported by Fibonacci heaps ?

Unit III

5. (a) How does the Bellman-Ford algorithm address negative-weight edges in graphs, and what are its limitations ?

   (b) Explain the concept of a reduction in computational complexity. How is it used to prove that a problem is NPcomplete ?

6. (a) What is Floyd-Warshall's algorithm ? Describe a situation where it would be more suitable than Dijkstra's algorithm.

(b) Explain the concept of "tractability" in computational complexity. How does it relate to classes like P and NP ?

Unit IV

7. (a) Explain the difference between "maximum matching" and "maximum cardinality matching" in the context of bipartite graphs.

   (b) Define a bitonic sequence. How does bitonic sorting utilize this property to perform sorting efficiently ?

8. (a) What is Ford-Fulkerson Method ? Describe how the Ford-Fulkerson Method is applied to solve a bipartite matching problem.

   (b) Explain the primary function of a merging network in parallel processing. Why is it important for combining outputs from multiple sources ?

Roll No. ..... Total Pages : 02

BT-5/D-24 45275

COMPUTER NETWORK
ES-CS-AIML-305A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. Explain ISO OSI Model and TCP/IP Model in detail. 15

2. Explain the following :
   (a) Network Topologies 8
   (b) Fiber Optics. 7

Unit II

3. Explain all the flow control algorithms in detail. 15

4. Describe the different network devices and their corresponding layers. 15

Unit III

5. Explain the following : 15

   (a) ARP

   (b) IGMP

   (c) ICMP

   (d) ATM

   (e) IPv4 Tunneling.

6. Write detailed notes on the following :

   (a) IPv4 and its classes 6

   (b) Routing Algorithms and its types. 9

Unit IV

7. Explain the following :

   (a) TCP and UDP header in detail 8

   (b) Congestion Control Algorithms. 7

8. Write short notes on the following : 15

   (a) DNS

   (b) SMTP

   (c) Public key and Private Key Encryption

   (d) Bluetooth

   (e) Digital Signatures.

Roll No. ..... Total Pages : 03

BT-5/D-24 45276

ARTIFICIAL NEURAL NETWORKS
PC-CS-AIML-307A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) How does the concept of linear separability affect the capability of a perceptron ? Provide examples of linearly separable and non-linearly separable datasets.

(b) What is Backpropagation ? How is it used in training multi-layer neural networks ?

2. (a) What is the significance of the activation function in a neural network ? Discuss the different types of activation functions.

(b) How do neural networks mimic the functioning of the human brain ? Explain the concept of biological inspiration in neural networks.

Unit II

3. (a) Explain the concept of energy minimization in Hopfield networks. How does it relate to the network's ability to store and retrieve patterns ?

   (b) Describe the role of the Grossberg layer in counter propagation networks. How does it contribute to the overall functionality ?

4. (a) What can techniques be employed to address the problem of vanishing and exploding gradients in backpropagation ?

   (b) What is the structure of bi-directional associative memories (BAMs) ? How does BAM retrieve a stored association ? Describe the process step by step.

Unit III

5. (a) What is Adaptive Resonance Theory (ART) ? What mechanisms does ART use to maintain stability-plasticity balance during the learning process ?

   (b) Explain the training process of cognitrons. What methodologies are used to adapt the network to recognize patterns ?

6. (a) Explain the concept of vector-matrix multipliers in optical neural networks. How do they facilitate processing ?

(b) In what situations would you prefer to use ART over cognitrons/neocognitrons and vice versa ? Discuss.

Unit IV

7. (a) Describe the architecture of a Convolutional Neural Network (CNN). What are its key components and how do they contribute to image processing ?

(b) What is RNN ? How do RNNs process sequential data differently from feedforward networks ?

8. (a) Describe Long Short-Term Memory (LSTM) networks. How do they improve upon traditional RNN architectures ?

(b) What is AutoML and how does it assist in optimizing the performance of deep learning models ?

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BT-5/D-24 45277

COMPUTER ARCHITECTURE
ES-CS-AIML-309A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) What is Computer Architecture ? Discuss Von-Neumann architecture of computer. 8

   (b) Devise an algorithm for addition and subtraction of two integers represented in sign magnitude representation. 7

2. (a) What is Memory Hierarchy ? Explain its working principle. 8

   (b) Devise an algorithm for division of two integers using non restoring method. 7

Unit II

3. (a) What do you mean by register reference instructions ? Explain their fetch decode execute cycle. 8

(b) What is control unit ? Explain the working of microprogrammed with suitable diagram. 7

4. (a) Explain typical registers used in computer architecture along with their purpose. 8

(b) What is Interrupt ? Explain interrupt cycle with the help of a flowchart. 7

Unit III

5. Explain stack based organization of Central Processing Unit (CPU). How is stack organization used for evaluating the arithmetic expressions written in postfix/reverse polish notation ? Explain with example. 15

6. (a) What is instruction level parallelism ? Explain the working of instruction pipeline with time pace diagram. 8

(b) Compare and contrast RISC and CISC. 7

Unit IV

7. What is the difference between Isolated I/O and memory mapped I/O ? What are the advantages and disadvantages of each ? 15

8. (a) What is Handshaking ? Explain source initiated handshaking with suitable timing diagram. 8

(b) What is priority interrupt ? Explain the working of daisy chain with suitable diagram. 7

Roll No. ..... Total Pages : 03

BT-5/D-24 45278

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

PC-CS-AIML-311A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Compare and contrast depth-first search and breadth-first search algorithms. What are the advantages and disadvantages of each ?

(b) What are production systems in AI ? Discuss their components and differentiate between commutative and noncommutative production systems.

2. (a) What is alpha-beta pruning and how does it optimize the min-max algorithm for game playing ?

(b) Write the algorithm of Hill climbing search. What are its limitations ? Discuss.

Unit II

3. (a) What is modus tollens ? How does it differ from modus ponens ? Provide an example of its usage.

   (b) What is backward chaining ? How does it differ from forward chaining and in what scenarios is it preferred ?

4. (a) What is Robinson's resolution principle ? How is it used in proof by refutation ? Illustrate.

   (b) What are semantic networks and how do they represent knowledge ? Discuss their structure and components.

Unit III

5. (a) What is Fuzzy logic ? Write a detailed note on different types of membership function in it.

   (b) What is first-order logic (FOL) ? Explain the significance of quantifiers in FOL.

6. (a) What is non-monotonic reasoning ? How does it differ from traditional logical reasoning ? Provide examples of its applications.

   (b) How do NLP systems handle ambiguity in language ? Discuss techniques that are used to resolve ambiguities in natural language.

Unit IV

7. (a) Explain the K-Means clustering algorithm. How does it work and what are its strengths and weaknesses ?

   (b) What are some evaluation metrics used to assess the quality of clustering results in unsupervised learning ?

8. (a) How can dimensionality reduction techniques, such as PCA, enhance the performance of clustering algorithms ?

   (b) What is unsupervised learning and how does it differ from supervised learning ? Discuss its importance in discovering patterns in data.

AIML 7th/ Lib.

Roll No. ..... Total Pages : 3

BT–7/D-24 **47420**

DATA SCIENCE WITH R PROGRAMMING

Paper–PC–CS–AIML–401A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least one question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Discuss the brief History of Data science.

   (b) What is Data analysis? Explain along with its various types.

2. What do you mean by Data pre-processing? Discuss the following Data pre-processing operations :

   (a) Data Integration. (b) Data Reduction.

UNIT–II

3. What is Data visualization? Explain the following Data visualization tools with suitable example of each :

   (a) ggplot2. (b) leaflet.

   (c) plotly.

4. (a) With the help of suitable example, explain the role of Statistics and Probability in Data science.

(b) Describe the following terms :

(i) Conditional Probability.

(ii) Probability Distribution.

UNIT–III

5. (a) What is R programming? Why R programming? Explain along with its various applications.

(b) With the help of suitable example and syntax, explain various operators used in R programming.

6. (a) What is an Array? Write a program how to add and remove a particular element in a given array ?

(b) What is Data frame? Explain various Data frame operations with the help of suitable example.

UNIT–IV

7. (a) What are csv files in R? With the help of suitable syntax, explain :

(a) Creating a csv file.

(b) Reading a csv file.

(c) Analyzing a csv file.

(d) Writing into a csv file.

8. (a) What is Regression in Machine learning? Explain the various terminology in relation with the same.

(b) Explain in detail the use of Data science in E-commerce.

Roll No. ..... Total Pages : 2

BT–7/D-24 **47422**

ROBOTICS AND INTELLIGENT SYSTEMS

Paper–OE–CS–AIML–401

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Discuss the brief history of Robotics.

   (b) Explain the various advantages and disadvantages of Robot.

2. (a) Discuss the Robot mechanism.

   (b) Describe the Robot application in Manufacturing Industry.

UNIT–II

3. (a) What do you mean by actuator? Also classify the actuator based on the motion.

   (b) Explain the following sensors :

   (i) Light Sensor.

(ii) Proximity Sensor.

4. (a) Describe in detail about the Robot operating system along with its key features.

(b) Define the Transducer. Explain the working principle of Transducer.

UNIT–III

5. (a) What is Computational Intelligence? Discuss the same along with its various types.

(b) Explain the concept of forward chaining with suitable example. Also, specify some of the advantages and disadvantages of forward chaining.

6. Describe the following terms :

(a) Uncertainty. along with sources of Uncertainty.

(b) Bayesian Updating.

UNIT–IV

7. With the help of suitable example, explain the following :

(a) Late Binding.

(b) Encapsulation.

8. Write a short note on any **two** of the following :

(a) Expert System.

(b) Information Retrieval.

(c) Semantic Web.

Roll No. ..... Total Pages : 3

BT-7/D-24 **47427**

SOFT COMPUTING

Paper–PE-CS-AIML-417A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Explain the major areas of Soft Computing and their roles in modern technology. How do these areas collectively contribute to problem-solving in Complex Systems? 8

   (b) Why is there a growing requirement for Soft Computing methods? Discuss the limitations of traditional Hard Computing that Soft Computing addresses. 7

2. Elaborate major techniques of Soft Computing, such as Neural Networks, Fuzzy Systems and Genetic Algorithms in detail with pros and cons also differentiate these techniques. 15

UNIT–II

3. (a) Describe the functioning of a Single Layer Perceptron. Discuss the limitations of Single Layer Perceptron's in solving complex problems. 8

   (b) Explain the Backpropagation algorithm and its importance in training Neural Networks. 7

4. (a) Elaborate the concept of Adaptive Resonance Theory (ART) and Self-Organizing Maps (SOM). Discuss their applications and how they differ from Backpropagation Networks ? 10

   (b) Discuss recent applications of Neural Networks. 5

UNIT–III

5. (a) Describe the process of fuzzification and defuzzification in Fuzzy Systems. Why are these processes essential and what methods are commonly used for each? 8

   (b) Discuss the properties and operations on fuzzy sets and explain their importance in Fuzzy Systems. 7

6. (a) Explain Lambda-cuts and their role in Fuzzy Sets. How do Lambda-cuts help in simplifying fuzzy sets for Practical applications? 8

(b) Elaborate the methods of assigning Membership values, including intuition, inference and Rank ordering. 7

UNIT–IV

7. (a) Discuss various encoding methods used in Genetic Algorithms. 7

   (b) Explain the roles of the GA operators-Reproduction, Crossover and Mutation. How do these operators contribute to the diversity and optimization of solutions in GAs? 8

8. Elaborate the concept of Genetic-Neuro Hybrid Systems and Genetic Fuzzy Rule-based Systems. Provide examples of how these Hybrid systems combine strengths of different Soft Computing techniques for enhanced problem-solving. 15

Roll No. ..... Total Pages : 4

BT–7/D-24 **47430**

DEEP LEARNING

Paper–PE–CS–AIML–423A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Explain the basic concepts of Machine learning algorithms. Discuss the differences between Supervised, Unsupervised and Reinforcement learning, and provide examples of each. 8

   (b) Describe the process of Maximum Likelihood Estimation (MLE) in building a machine learning algorithm. How is MLE used to estimate the parameters of a model? Provide a detailed explanation and an example. 7

2. (a) Discuss the Architecture and functioning of a Multilayer Perceptron (MLP). Explain how the back-propagation algorithm is used to train a Neural Network, including its variants like Stochastic Gradient Descent? 8

(b) Explain the concept of the Curse of Dimensionality in the context of Machine learning. How does it affect the performance of Algorithms and what strategies can be used to mitigate its effects? Provide examples to illustrate your points. 7

UNIT–II

3. (a) Discuss the different types of Deep Learning Architectures. Explain how Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) are used in various applications, highlighting their unique characteristics and advantages ? 8

(b) Describe the importance of Activation Functions in Neural Networks. Compare and contrast the functions of RELU, LRELU and ERELU and provide examples of scenarios where each might be most effective. 7

4. (a) Explain the concept of Unsupervised Training of Neural Networks. Discuss the role and working of Restricted Boltzmann Machines (RBMs) and Auto Encoders in unsupervised learning, and their applications in Real-world problems. 8

(b) Illustrate the significance of the width and depth of Neural Networks. How do these parameters influence the performance and complexity of the network? Provide examples of how different configurations can affect the outcomes in specific applications ? 7

UNIT–III

5. (a) Explain the Architectural components of Convolutional Neural Networks (CNNs). Discuss the Motivation behind using CNNs and how layers, filters and parameter sharing contribute to their effectiveness in Image processing ? 8

   (b) Discuss the concept of Regularization in CNNs. Explain how techniques such as dropout, batch normalization, and Data augmentation help in preventing overfitting in neural networks ? 7

6. (a) Compare and contrast the Architectures of ResNet and AlexNet. Highlight their key features, innovations, and how these architectures have impacted the field of deep learning? 8

   (b) Describe the practical applications of CNNs in real-world scenarios. Provide examples of how CNNs are used in fields such as Medical imaging, autonomous driving, and facial recognition? 7

UNIT–IV

7. (a) Explain the concept of transfer learning in deep learning. Discuss how transfer learning techniques can be applied to improve the performance of Machine learning models, providing specific examples of Scenarios where this approach is beneficial? 8

(b) Discuss the Architectures of DenseNet and PixelNet as variants of Convolutional Neural Networks (CNNs). Compare their unique features, advantages, and potential applications in real-world tasks. 7

8. (a) Describe the Architecture and functioning of Bidirectional Recurrent Neural Networks (RNNs). Explain how Bidirectional RNNs differ from standard RNNs and their applications in natural language processing and other sequential data tasks ? 8

(b) Explain the Encoder-Decoder sequence-to-sequence architecture. Discuss the role of Backpropagation Through Time (BPTT) in training Recurrent Neural Networks (RNNs) and the significance of Long Short Term Memory (LSTM) networks in addressing the limitations of traditional RNNs. 7

Roll No. ..... Total Pages : 2

BT-7/D-24 **47431**

WORKING WITH RASPBERRY PI & ARDUINO PLATFORM

Paper–PE-CS-AIML-425A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Discuss various application areas of Embedded system.

   (b) Explain the various issues of Microcontroller.

   (c) Differentiate between Microcontroller and Microprocessor.

2. (a) How IoT works? Explain with the help of some real time examples.

   (b) Draw and explain the Architecture of IoT.

UNIT–II

3. (a) What is Arduino UNO board? Explain overview of Arduino UNO board.

   (b) Discuss about the Arduino programming control structures with an example.

4. With the help of suitable example, explain following operators in Arduino Programming:

   (a) Boolean operator.

   (b) Bitwise operator.

UNIT–III

5. (a) Justify how Raspberry Pi is different from a desktop computer.

   (b) Write a short note on various Raspberry Pi interfaces used for Data transfer.

6. (a) Design an Automatic Refrigerator light system with LED, switch and Raspberry Pi. Also, write a Python program to support the working of the same.

   (b) Discuss the various conditional statements used in Python with suitable syntax.

UNIT–IV

7. (a) Explain Ultrasonic distance sensor along with its working principle.

   (b) Explain the Servo motor along with its duty cycle.

8. (a) Explain the various steps for Programming the DHT11 temperature sensor in Python.

   (b) How to enable camera functionality on Raspberry Pi? Explain with the help of suitable example.

Roll No. ..... Total Pages : 2

BT–7/D-24 **47394**

UNIVERSAL HUMAN VALUES II : UNDERSTANDING HARMONY

Paper–HSS–403A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. Discuss the concept of Self exploration in detail. Discuss the one proposal which you have Self explored in your life during this course. Define continuous happiness and prosperity. 5,5,5

2. Discuss and prioritize the basic requirements for fulfillment of Human aspirations. Discuss the value education and its guidelines. 7,8

UNIT–II

3. Discuss the concept of Co-existence of Self and Body. Discuss the concept of Body as instrument of the Self. Discuss the Harmony of Self. 5,5,5

4. Discuss the Harmony of self with the body. Discuss the program of self regulation to ensure health of the body. 6,9

UNIT–III

5. Discuss the feeling of Trust and Respect in detail between Huma-Human Relationships. 15

6. Discuss the concept of Harmony in society. Discuss various systems of Human order in Society. 5,10

UNIT–IV

7. Discuss the various orders in nature. Discuss the interconnectedness between them. Discuss Harmony in nature in detail. 5,5,5

8. Discuss the concept of Coexistence in detail. Discuss the concept of Universal Human order in detail. 8,7

AIML 8th/ Lib

Roll No. ..... Total Pages : 03

BT-8/D-24 **48426**

OPTIMIZATION METHOD IN ML

PC-CS-AIML-402A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Elaborate convex sets and their properties with examples. **8**

   (b) Discuss the KKT conditions and their role in convex optimization. **7**

2. Compare and contrast linear programming, second-order cone programming and semidefinite programming. **15**

Unit II

3. Explain the concept of Nesterov's accelerated gradient method with applications. **15**

4. (a) Differentiate between proximal gradient methods and mirror descent. **8**

   (b) Discuss the role of Moreau-Yosida regularization in optimization. **7**

Unit III

5. Describe the Alternating Direction Method of Multipliers (ADMM) and its applications. **15**

6. (a) Explain primal and dual decomposition in convex optimization. **8**

   (b) Discuss the Douglas-Rachford splitting method with an example. **7**

Unit IV

7. Explain the Stochastic Variance Reduced Gradient (SVRG) method and its significance. **15**

8. (a) Discuss Langevin dynamics and its application in escaping saddle points. 8

(b) Elaborate the landscape of non-convex problems in the context of deep learning. 7