

Roll No.

Total Pages : 4

BT-3/D-24

43216

MATHEMATICS FOR BIG DATA AND OPTIMIZATION

Paper-BS-CS-AIDS-201A

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) Prove that $x \cos x = -\frac{1}{2} \sin x + 2 \sum_{n=2}^{\infty} \frac{n(-1)^n}{n^2 - 1} \sin nx$ in the interval $-\pi < x < \pi$. 7½

(b) Find a Fourier Series for the function given by

$$f(t) = \begin{cases} t & 0 < t < 1 \\ 1-t & 1 < t < 2 \end{cases} \quad 7½$$

2. (a) Using Parseval's identities, prove that $\int_0^{\infty} \frac{dx}{x^2 + 1} = \frac{\pi}{4}$. 7½

(b) Using finite Fourier transform, find the solution of the

wave equation $\frac{\partial^2 u}{\partial t^2} = \frac{a^2 \partial^2 u}{\partial x^2}$

Subject to the conditions : $u(0, t) = u(\pi, t) = 0$,

$u(x, 0) = 3 \sin x + 4 \sin 4x$ and $u_t(x, 0) = 0$

for $0 < x < \pi$.

7½

UNIT-II

3. (a) Solve $x \frac{dy}{dx} + y = x^3 y^6$.

7½

(b) Solve $(x^3 y^2 + x)dy + (x^2 y^3 - y)dx = 0$.

7½

4. (a) Solve $(D^3 + 2D^2 + D)y = x^2 e^{3x}$.

7½

(b) Solve $x^2 \frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + 6y = x^2$.

7½

UNIT-III

5. (a) Find the missing values in the following table :

x	45	50	55	60	65
y	3.0	-	2.0	-	-2.4

7½

(b) Find the cubic polynomial which takes the following values :

x	0	1	2	3
f(x)	1	2	1	10

Hence or otherwise evaluate $f(4)$.

7½

6. (a) Compute the value of $\int_{0.2}^{1.4} (\sin x - \log x + e^x) dx$ using Simpson's $\frac{3}{8}$ th rule. 7½
- (b) Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$. 7½

UNIT-IV

7. (a) What are the application models of optimisation used in engineering? 7½
- (b) Old hens can be brought at Rs. 20 each and young ones at Rs. 50 each, the old hens lay 3 eggs per week and the young ones lay 5 eggs per week, each egg being worth Rs. 3. A hen (young or old) costs Rs. 3 per week to feed. Raju has only Rs. 1000 to spend on hens. He has 25 square units of space and the minimum space units requires for the hens vary as the square of the number of hens (old and new hens are to be housed separately). How many hens of each kind should Raju buy to earn a profit at least Rs. 60 per week? 7½
8. (a) Find by graphical method the minimum value of

$$z = 4x + 2y$$

subject to $x + 2y \geq 2,$
 $3x + y \geq 3,$
 $4x + 3y \geq 6,$
 and $x, y \geq 0.$ 7½

(b) Maximize $z = 2x + y$

subject to $x + y \leq 6,$

$x^2 + y^2 \leq 25,$

$x, y \geq 0.$

7½

UNIT-IV

7. (a) What are the application models of optimisation used in engineering?

(b) Old hens can be brought at Rs. 50 each and young ones at Rs. 20 each, the old hens lay 3 eggs per week and the young ones lay 5 eggs per week, each egg being worth Rs. 3. A hen (young or old) costs Rs. 5 per week to feed. Raju has only Rs. 1000 to spend on hens. He has 25 square units of space and the minimum space units required for the hens vary as the square of the number of hens (old and new hens are to be housed separately). How many hens of each kind should Raju buy to earn a profit at least Rs. 60 per week?

8. (a) Find by graphical method the minimum value of

$z = 4x + 3y$

subject to $x + 2y \leq 2,$

$3x + y \leq 3,$

$4x + 3y \leq 6,$

and $x, y \geq 0.$

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43217

BT-3/D-24

OBJECT ORIENTED PROGRAMMING

Paper : PC-CS-AIDS-203A

Time : Three Hours]

[Maximum Marks : 75

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

Compulsory Question

1. What is object oriented programming? Explain various features of object oriented programming. Write a program in C++ to explain features of object oriented programming. (15)
2. (i) Define function overloading. Write a program to implement function overloading. (8)
(ii) Differentiate b/w structure and class with suitable program in C++. (7)

UNIT-II

3. Differentiate b/w multiple and multilevel inheritance with suitable program in C++. Also explain concept of virtual base class. (15)
4. Define constructors. Explain various types of constructors. Write a program in C++ to explain various types of constructors. (15)

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UNIT-III

5. Explain Operator Overloading. List rules of operator overloading. Create a class Polar which describes a point in the plane using polar coordinates radius and angle. Use the overloaded + operator to add two objects of class Polar.
6. Distinguish between early binding and late binding. Develop a program to implement the concept of virtual functions. (15)

UNIT-IV

7. (i) Explain concept of file handling in C++ with suitable program. (8)
(ii) Define templates. Develop a program in C++ to implement concept of templates. (7)
 8. Explain Exception Handling in C++. Illustrate mechanism of exception handling with suitable program in C++. Also explain concept of rethrowing of an exception. (15)
-

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43218

BT-3/D-24

DATA STRUCTURES AND ALGORITHMS

Paper : PC-CS-AIDS-205A

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 different types of data structures and discuss their use cases in computer science. (8)
- (b) Describe the concept of time and space complexity. How do these complexities impact algorithm performance? (7)
2. (a) What is an Abstract Data Type (ADT)? Explain with examples how ADTs are useful in programming? (8)
- (b) Illustrate the difference between primitive and non-primitive data structures with suitable examples. (7)

UNIT-II

3. (a) Discuss the types of linked lists and describe a real-world application for each type. (8)

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- (b) Write and explain an algorithm to reverse a singly linked list. (7)
4. (a) Explain the operations that can be performed on an array. Provide examples of each operation. (8)
- (b) Compare and contrast arrays and linked lists in terms of memory allocation, access time, and flexibility. (7)

UNIT-III

5. (a) Explain the working of a stack with a real-life example. Describe its main operations. (8)
- (b) Differentiate between linear and circular queues, and explain how overflow is managed in each? (7)
6. (a) Describe how a stack can be used to evaluate a postfix expression with an example? (8)
- (b) Discuss the concept of recursion and its implementation using stacks. (7)

UNIT-IV

7. (a) Explain the properties of binary trees and discuss how they differ from general trees? (8)
- (b) Describe Depth First Search (DFS) and Breadth First Search (BFS) algorithms with examples. (7)

8. (a) What is a binary search tree (BST)? Illustrate its insertion and deletion operations with examples. (8)
- (b) Explain different types of tree traversals (preorder, inorder, postorder) and provide examples for each. (7)
-

43219

BT-3/D-24

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Paper : PC-CS-AIDS-207A

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) Discuss the various applications of Artificial Intelligence (AI) in different fields such as games, theorem proving, natural language processing, vision and speech processing and robotics. How do these applications demonstrate the scope of AI?

8

(b) Define heuristic-based search techniques in AI. Discuss the principles and applications of hill climbing, best-first search, and branch and bound in solving complex problems. Provide examples of each technique.

7

2. (a) Explain the concept of state space search in problem-solving. Describe the differences between depth-first search and breadth-first search, and discuss their advantages and disadvantages in state space search.

8

- (b) Discuss the methods of problem reduction and constraint satisfaction in AI. Explain the process of means-end analysis and how it can be used to solve complex problems by breaking them down into manageable parts. 7

UNIT-II

3. (a) Explain the Minimax Algorithm and its application in game playing. Discuss how Alpha-Beta Cutoff enhances the efficiency of the Minimax Algorithm and provide examples to illustrate the process. 8
- (b) Discuss the various methods of knowledge representation in AI, with a focus on Rule-based systems. Compare and contrast declarative and procedural representation, providing examples of how each is used in practical applications. 7
4. (a) Describe the principles of Predicate Logic and its components such as Unification, Modus Ponens, and Modus Tolens. How do these concepts contribute to knowledge representation and reasoning in AI? 8
- (b) Explain the concept of Semantic Nets in structured knowledge representation. Discuss the role of slots, exceptions, and default frames in creating and managing semantic networks, and how they contribute to AI understanding and reasoning. 7

UNIT-III

5. (a) Discuss the syntax and semantics of first order logic. How do these elements differ from propositional logic, and what advantages do they provide in knowledge representation and inference? 8
- (b) Explain the concepts of forward chaining and backward chaining in inference mechanisms. Compare their working principles and applications in solving problems using first order logic. 7
6. (a) Outline the key stages of Natural Language Processing (NLP) : syntactic processing, semantic processing, and pragmatic processing. Explain how each stage contributes to the overall understanding and generation of human language by machines. 8
- (b) Describe the role of probabilistic reasoning in handling uncertainty. How do certainty factors and fuzzy logic contribute to making decisions in uncertain environments? Provide examples to illustrate your points. 7

UNIT-IV

7. (a) Describe the process of knowledge acquisition in expert systems. Discuss the need and justification for expert systems, using MYCIN and RI as case studies to highlight their effectiveness and impact.

8

(b) Explain the concept of inductive learning and how it is used to form learning decision trees. Provide an example of a situation where inductive learning is beneficial. 7

8. (a) Discuss the significance of ensemble learning in improving the accuracy of machine learning models. Compare different ensemble methods such as bagging, boosting, and stacking, providing examples for each. 8

(b) Explain the principles of genetic algorithms and their application in learning with hidden variables. Discuss how genetic algorithms can solve complex optimization problems, providing an example to illustrate their use. 7

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43220

BT-3/D-24

PROGRAMMING LANGUAGE

Paper-PC-CS-AIDS-209A

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 type checking and type conversions are initiated by the various programming languages? Explain with some basic programs by taking any programming language. (8)
- (b) How to specify, initialize and implement the enumeration, Booleans and characters in the programming languages? (7)

2. (a) Identify and explain the various characteristics of a good programming language. What are the factors influencing the writability of a language? (8)
- (b) Define syntax and semantics. Identify the general problems of describing syntax and semantics and how to resolve such problems. (7)

UNIT-II

3. (a) Define structured data objects. How to specify and implement the sets and files in the programming languages? (8)
- (b) Identify the role of abstraction. Differentiate between information hiding and encapsulation by taking some practical examples. (7)
4. (a) Define subprogram. Explain different categories of subprogram. Also, differentiate between overloaded subprograms and generic subprograms. (8)
- (b) How to specify and implement the pointer and programmer defined data objects in the programming languages? (7)

UNIT-III

5. (a) Write in detail about the process of synchronization through semaphores, monitors and message passing. (8)
- (b) Define scope. Classify the roles of using static scoping and dynamic scoping with relevant examples. (7)
6. (a) Define sequence control and data control. Explain and differentiate between the call by reference and call by name by taking suitable examples. (8)
- (b) List and explain design issues of pointers. Highlights and explain the behaviour of recursive subprograms. (7)

UNIT-IV

7. (a) Explain stack based storage management and heap storage management for fixed size and variable size elements. (8)
- (b) Identify the major run time elements which require storage. Explain different types of propositions present in logic programming. (7)
8. (a) What are the problems posed by managing a heap of single-size cell and variable size cell? Explain in detail various methods for reclaiming garbage. (8)
- (b) Explain how backtracking works in Prolog and also compare the concept of data typing in Ada with that of Prolog? (7)
-

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43221

BT-3/D-24

BUSINESS INTELLIGENCE AND ENTREPRENEURSHIP

Paper-HM-902

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. Discuss the relationship between entrepreneurship and economic development. How does entrepreneurship contribute to the overall economic growth of a country? Analyze the role of entrepreneurs in job creation, innovation, and wealth generation.
2. Explain the various types and classifications of entrepreneurs, focusing on their competencies and qualities.

UNIT-II

3. How entrepreneurial opportunities are identified and feasibility studies are conducted?
4. How market research is conducted? Which are different methods of project appraisal?

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UNIT-III

5. What is the definition and objectives of SSI and MSME? What is their role in economic development?
6. Which are different MSME schemes? Which are different challenges and difficulties in availing these schemes?

UNIT-IV

7. Which institutions are involved in supporting and management of small businesses? Write functions and objectives of any *two* institutions.
8. Which are the requirements of formation of a private/public limited companies in India? Which legal issues must be taken care of?

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BT-5/D-24

45261

THEORY OF COMPUTATION

PC-CS-AIDS-301A

Time : Three Hours]

[Maximum Marks : 75

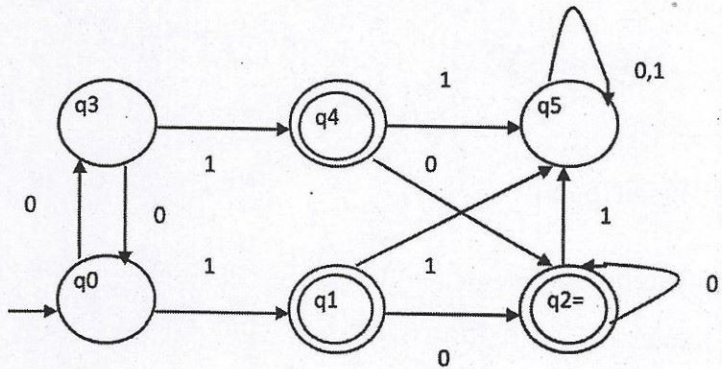
Note : Attempt *Five* question in all; selecting at least *one* question each from Unit I to Unit IV. All questions carry equal marks.

Unit I

1. (a) Draw a deterministic and non-deterministic finite automate which accept 00 and 11 at the end of a string containing 0, 1 in it, e.g., 01010100 but not 000111010.
- (b) What is the difference between epsilon and Phi in automata ? Can DFA have epsilon transitions ? What is finite automata with epsilon transitions ? **8+7=15**
2. (a) Define regular expression. Explain the applications and laws of regular expression.

(b) Minimize the following DFA :

8+7=15

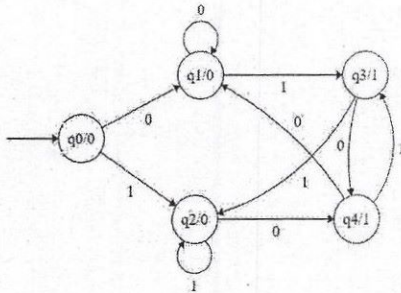


Unit II

3. (a) Explain the properties and ambiguity in context free language and grammar. Convert the given CFG into GNF $S \rightarrow AB$, $A \rightarrow BS \mid 1$, $B \rightarrow SA \mid 0$
- (b) Expand Chomsky Classification of language taking suitable example of each classification. 8+7=15
4. (a) State pumping lemma. Prove that the given language $L = \{a^n b a^m b a^{n+m} \mid n, m \geq 1\}$ is non-regular language.
- (b) What are the applications of pumping lemma ? Discuss pumping lemma for regular languages. 8+7=15

Unit III

5. Difference between Moore and Mealy Machines with their State transition diagram. Convert Moore to Mealy Machine for the following : 15



6. Explain the block diagram of PDA with its components, specification, language and transition table. State the equivalence of PDA's and CFG's. 15

Unit IV

7. Explain the different types of Turing Machine. Design a Turing machine which recognises the language generated by the following regular grammar :

$$G \text{ df} = \{a, b\}, \{S, A, B\}, P, S P = \{S \rightarrow bA \mid aB, \\ A \rightarrow aB \mid a, B \rightarrow bA \mid b \}$$
15

8. (a) Discuss the properties and proof of Rice's theorem.
- (b) State and prove that Post's correspondence problem is undecidable with one example. **8+7=15**

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Total Pages : 04

BT-5/D-24

45262

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

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory.
All questions carry equal marks.

1. Answer the following questions in brief :

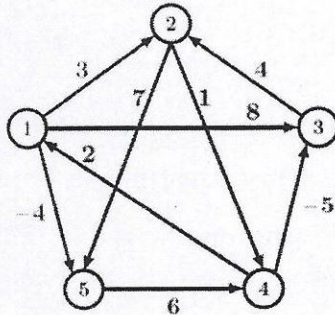
- (a) What is priority queue ? Find its complexity. 3
- (b) Solve the following recurrence relation using Master theorem : 3

$$T(n) = 2T(n/4) + \sqrt{n}. \quad 3$$

- (c) Define the sorting network and illustrate it with example. 3
- (d) Define relaxation and write its function. 3
- (e) Algorithm A requires n^2 days and algorithm B requires n^3 seconds to solve a problem. Which algorithm would be prefer for a problem instance with $n = 10^6$. Provide brief explanation, why ? 3

2. (a) Explain the fundamental steps of finding longest common subsequence using dynamic programming. Find LCS between two strings X = BACDB and Y = BDCB. 8

- (b) What is binomial heap ? Write the pseudo code of binomial heap creation algorithm. 7
3. (a) Explain Floyd-Warshall Algorithm to find all pair shortest path. Find all pair shortest path of the following problem also analyze its complexity. 8



- (b) Define spanning tree. Write the pseudo code of Kruskal algorithm for finding minimum spanning tree. Also analyze its complexity. 7
4. (a) Explain Fibonacci heap. Write pseudo code for inserting an element into Fibonacci heap also illustrate it with example. 7
- (b) Explain the following terms with example: class P, class NP, NP hard and NP complete problem. 8
5. (a) Define the maximum flow in the flow network. Explain Ford-Fulkerson Algorithm for finding maximum flow in flow network. 8

(b) What is asymptotic notation ? Explain big-oh, big-theta and big-omega in detail with graphical representation. 7

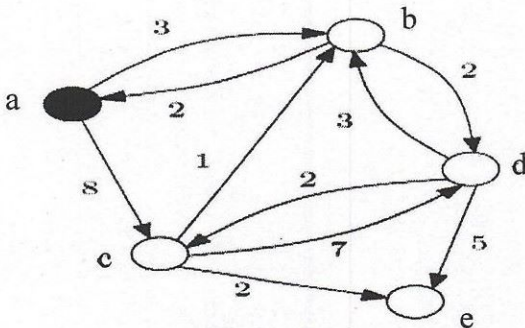
6. (a) Solve the following recurrence relation using substitution method :

$$T(n) \begin{cases} 1 & \text{if } n=1 \\ 2T\left(\frac{n}{2}\right) + \theta(n) & \text{if } n > 1. \end{cases} \quad 7$$

(b) Explain Strassen's matrix multiplication algorithm and compute the matrix multiplication of the following using Strassen's algorithm :

$$X = \begin{bmatrix} 3 & 2 \\ 4 & 8 \end{bmatrix}, \quad Y = \begin{bmatrix} 1 & 5 \\ 9 & 6 \end{bmatrix}. \quad 8$$

7. (a) Write the constraints of Bellman ford Algorithm. Find the shortest paths starting from vertex a using Bellman ford algorithm and show all its steps. 8



- (b) Define matching in a bipartite graph. Explain the steps to solve the Maximum Bipartite Matching (MBP) problem along with example.
8. (a) Explain the working principle of the zero-one principle with example. **5**
- (b) What is Merging Network ? Explain with example. **5**
- (c) Write Huffman code for the following symbols : **5**

Symbol	A	B	C	D	E	F
Frequency	45	12	13	16	9	5

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Total Pages : 03

BT-5/D-24

45263

COMPUTER NETWORK
EC-CS-AIDS-305A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory.
All questions carry equal marks.

1. Answer the following questions in brief :

- (a) What is digital signature ? Brief about it technique. 3
- (b) Explain the types of transmission modes. 3
- (c) Compare the HDLC and PPP. 3
- (d) What is the basic concept of Bluetooth ? 3
- (e) What are the responsibilities of Transport Layer ? 3

2. (a) Explain different types of switching techniques. Also define relevance of each. 7

(b) A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28. 8

- (i) What is the first address in the block ?
- (ii) Find the last address for the block.
- (iii) Find the number of addresses.

3. (a) Illustrate TCP/IP reference model with a neat diagram. 7
- (b) What is Multiplexing ? Explain frequency Division, Time Division and Wavelength Division. 8
4. (a) What are the advantages of IPV6 addressing ? Give frame structure of IPV6 header. Explain which network layer protocol is responsible for address resolution. 8
- (b) Differentiate static, dynamic and active documents used in World Wide Web. 7
5. (a) With an example explain the Flooding, Hierarchical routing algorithms used in computer networks. 7
- (b) What is random access protocol ? Differentiate between pure ALOHA and slotted ALOHA. 8
6. (a) What is Routing ? Explain distance vector routing algorithm and link state routing algorithm in detail. 7
- (b) What is Congestion ? Explain Leaky bucket algorithm for congestion control. Also write its merit and demerit. 8

7. (a) Explain the fundamentals of public key encryption algorithm. Write the characteristics of public key. 8
- (b) How does UDP differ from TCP ? List the applications of UDP. 7
8. (a) Describe the working principle of Carrier sense multiple access with collision Detection (CSMA/CD). 8
- (b) What is the significance of Error control Mechanism ? Explain the ways and various techniques of error control ? 7

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Total Pages : 03

BT-5/D-24

45264

**MACHINE LEARNING WITH
USING PYTHON
PG-CS-AIDS-307-A**

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 is a list different from a tuple in Python ?
Using list comprehension, create a list of squares of even numbers from 1 to 20, excluding numbers divisible by 4.
- (b) Explain the difference between for and while loops in Python. Provide an example of a situation where a while loop would be more appropriate than a for loop.
2. (a) Explain the difference between *args and **kwargs in Python functions. Provide an example of when each would be useful.

- (b) Explain, how instance variables differ from class variables in Python ? Provide an example showing the difference.

Unit II

3. (a) Describe the process of training and testing a model in scikit-learn. Why is splitting data into training and testing sets necessary ?
- (b) Explain the main differences between `pd.read_csv()`, `pd.read_excel()`, and `pd.read_sql()` in Pandas. When would each be preferable ?
4. (a) Define supervised and unsupervised learning and give an example of a problem each would solve.
- (b) Implement a basic linear regression model using scikit-learn to predict housing prices based on square footage. Explain, how you would interpret the model's coefficients ?

Unit III

5. (a) Write Python code to implement a linear regression model using scikit-learn. Describe scenarios where nonlinear regression is more appropriate than linear.

- (b) Describe, how the value of k affects the bias-variance trade-off in KNN ? How would you choose an optimal k for a given problem ?
- 6. (a) Compare and contrast hierarchical clustering with K-means clustering. What are the advantages of hierarchical clustering ?
- (b) Explain the difference between user-based and item-based collaborative filtering. What are some challenges associated with collaborative filtering ?

Unit IV

- 7. (a) Describe the steps involved in using linear regression in SystemML for a dataset that fits in memory.
- (b) What factors impact the performance of SystemML compared to Spark MLlib, especially when handling simple versus complex machine learning tasks ?
- 8. (a) Explain the role of MLContext in SystemML. How does it facilitate the integration of SystemML with Apache Spark for machine learning tasks ?
- (b) How does SystemML implement unsupervised learning algorithms such as K-means clustering ?
Discuss.

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45265

COMPUTER ARCHITECTURE

ES-CS-AIDS-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) Explain evolution of Computer Generations in detail. 7
(b) Explain Digital arithmetic algorithm for addition and subtraction. 8
2. Explain Memory Organization in detail with memory hierarchy. 15

Unit II

3. (a) Explain Stored Program Organization. 7
(b) Explain basic Computer Instruction Formats with example. 8

4. (a) What is control memory ? Explain the role of Microprogram Sequencer. 8
- (b) Differentiate between Hardwired and Microprogrammed control unit. 7

Unit III

5. Discuss one address, two address, three address and zero address instructions. Take suitable example to justify your answer. 15
6. Write short notes on the following :
- (a) Pipeline and Vector processing 8
- (b) Flynn's Taxonomy. 7

Unit IV

7. Discuss different methods of Asynchronous data transfer in detail. 15
8. Write short notes on the following :
- (a) Input output processor 7
- (b) Interrupt driven I/O. 8

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BT-5/D-24

45266

ARTIFICIAL NEURAL NETWORKS

PC-CS-AIDS-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 Leaky ReLU, Parametric ReLU (PReLU) and Exponential Linear Unit (ELU). How do these variations address specific limitations of ReLU ?
(b) Explain, how Hebbian learning differs from supervised learning in artificial neural networks ? In what scenarios is Hebbian learning most appropriate ?
2. (a) How would you implement a simple ANN using TensorFlow or PyTorch ? Describe the basic structure and functions used.

- (b) How do biological neural networks differ structurally and functionally from artificial neural networks (ANNs) ?

Unit II

- 3. (a) What is a Radial Basis Function (RBF) network and how does it differ from traditional feed-forward neural networks ?
 - (b) Describe the process of calculating gradients in back-propagation. How does the chain rule apply when computing gradients across multiple layers ?

- 4. (a) Explain, how regularization helps to prevent overfitting in neural networks ? What are the mathematical principles behind regularization ?
 - (b) Describe the role of momentum in back-propagation. How does it help in achieving faster and more stable convergence ?

Unit III

- 5. (a) Describe the Delta rule for pattern association. How does it differ from the Hebb rule and in what situations is it preferred ?

- (b) Explain, how convergence and stability issues are addressed in auto-associative memory networks ?
What are some common techniques for achieving stable recall ?
6. (a) What is recurrent auto-associative memory and how does it differ from feedforward associative memory networks ?
- (b) Explain the concept of stability in BAM. What conditions are necessary for a BAM network to achieve stable associations ?

Unit IV

7. (a) Explain the concept of cluster formation in SOM. How does the network learn to organize similar inputs into clusters ?
- (b) Describe the limitations of a single-layer perceptron in terms of its ability to classify linearly non-separable data.
8. (a) Explain the Adaline (Adaptive Linear Neuron) network and how does it differ from a perceptron ?
What is the significance of the mean squared error in Adaline ?

- (b) What is the recall mode in a self-organizing network ? Describes, how does it differ from the learning mode ?

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47393

**BUSINESS INTELLIGENCE AND DATA
VISUALIZATION**

Paper-HM-CS-AIDS-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) Describe the structure of DSS with diagram. 7
(b) What are the factors that affect the degree of success of a DSS? 8
2. (a) Explain the various strategic techniques used in implementing BI. 7
(b) Explain the technological requirements for managing and organizing an effective BI team. 8

UNIT-II

3. (a) Why is the Entity-relationship modelling technique not suitable for the Data warehouse? 7

47393/K/891/100

P. T. O.

- (b) Describe in detail Data ware house architecture and its components with neat sketch. 8
4. Briefly explain about Real-time data Ware-housing. Also discuss about the issues related to it. 15

UNIT-III

5. (a) Explain the following : 7
(i) Noisy Data. (ii) Data Cleaning.
- (b) Discuss about the Big Data Technologies. 8
6. (a) Summarize the classification tree's Splitting rules, Stopping criteria, and Pruning criteria. 7
- (b) Define HADOOP and its components 8

UNIT-IV

7. What is the Process involved in transforming Raw Data into a Visual format and How different types of Charts and Graphs are used in Data visualization? 15
8. (a) Which Data Visualization is frequently used to show the relationship between two Numerical variables, and why, explain using an appropriate example? 7
- (b) Write short notes on the following : 8
(i) Six Sigma. (ii) Visual Analytics.

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

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P. T. O.

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

Roll No.

Total Pages : 2

BT-7/D-24

47395

CYBER LAW AND ETHICS

Paper-OE-CS-AIDS-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) How do you describe the evolution of Technology? 8
- (b) Discuss various terms and conditions related to Web development agreement. 7
2. (a) How Internet acts as a tool for Global access? 7
- (b) Differentiate Doctrinal approach and Consensual approach with example. 8

UNIT-II

3. What is IT act 2000? Discuss its important sections? How many schedules and chapters are covered under IT Act 2000? 15

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P. T. O.

4. (a) Discuss the structure of the Cyber appellate tribunal. List the provisions in the IT Act, 2000 for the Cyber Appellate Tribunal. 8
- (b) Differentiate Digital signature and Digital certificate. Explain the working of Digital signature? 7

UNIT-III

5. (a) Differentiate CrPc and CPC? 7
- (b) What is Electronics database? Discuss various protection mechanisms used for electronic database. 8
6. (a) Differentiate ADR and ODR with example. 7
- (b) Explain the structure of Indian Panel code? Discuss its important section. 8

UNIT-IV

7. (a) Explain the Architecture of AI. Discuss Common ethical challenges in AI. 8
- (b) Discuss the need of Cyber relation Cyber ethic in detail. 7
8. (a) Differentiate trade mark and patent with example. 7
- (b) Explain the Architecture of block chain? Discuss its various applications. 8

Roll No.

Total Pages : 2

BT-7/D-24

47400

DATA MINING & PREDICTIVE MODELLING

Paper-PE-CS-AIDS-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) Describe the Concept and Technologies used in Data Mining. 7
- (b) Describe the steps in Data Mining Process. 8
2. What are the Applications and Challenges of Data Mining? 15

UNIT-II

3. (a) Discuss Statistical Perspective on Data Mining. 8
- (b) What is Clustering and requirement for Cluster Analysis? 7

47400/K/1012/100

P. T. O.14

4. Write notes on the Following : $2 \times 7\frac{1}{2} = 15$

(a) Decision Tree and Decision Tree induction.

(b) Association Rule mining.

UNIT-III

5. Describe various Model Development techniques. 15

6. Explain Bayesian Networks & Cox regression. 15

UNIT-IV

7. Describe the Model Evaluation, Deployment and Validation techniques. 15

8. (a) What is MetaLevel Modeling? 8

(b) Explain Evaluation Charts for Model Comparison. 7

Roll No.

Total Pages : 2

BT-7/D-24

47406

NATURAL LANGUAGE PROCESSING

Paper-PE-CS-AIDS-429A

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. Explain the key algorithm in Noisy Channel Paradigm. Explain syntax and semantics of NLP. 15
2. Explain Semantic net, Frames and Conceptual dependency representation in Natural Language Processing in detail. 15

UNIT-II

3. What are different Features of Prolog Language ? Write a program in prolog calculate factorial of any number. 15
4. What do you mean by Formal Languages ? Explain the ambiguous grammar and write the steps to resolve the ambiguity of grammar with the help of an example. 15

47406/K/1011/100

P. T. O.

UNIT-III

5. What do you mean by Recursive Transition Networks (RTN) and explain CKY parsing technique with the help of an example ? 15
6. Explain Graph Model and optimization in NLP with the help of an example. 15

UNIT-IV

7. What are different application of Natural Language processing in reference of Intelligent Work Processor, Machine Translation and Natural Language Query with the help of an example ? 15
8. What are different steps in recognising the speech of Human and also explain different use of Natural Language Processing ? 15

Roll No.

Total Pages : 02

BT-8/D-24

48403

**APPLICATION OF DATA SCIENCE IN
INDUSTRY
PE-CS-AIDS-416A**

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 following terms : 7.5
 - (i) Vectors
 - (ii) Null space.
- (b) Explain the terms distance and Projections in geometric view. 7.5
- 2. How Decomposition of eigenvalue is done ? Explain. 15

Unit II

- 3. Explain the following : 15
 - (a) Mean Variance
 - (b) Descriptive statistics
 - (c) Univariate distributions.

4. Differentiate between Covariance and Covariance Matrix and explain the concept of covariance matrix with the help of example. 15

Unit III

5. Explain the following terms : 15
- (a) Classification using logistic regression
 - (b) Multivariate Linear Regression.
6. Write k-means clustering algorithm and explain it. 15

Unit IV

7. (a) How can we use PySpark for Data Analytics ? 7.5
- (b) Write in brief case study of OLAP Tool for the food industry. 7.5
8. Explain the case study of Walmart supply chain management and Google company in detail. 15