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UNITED INSTITUTE OF TECHNOLOGY

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Periyanaickenpalayam, Coimbatore – 641020

DEPARTMENT OF INFORMATION TECHNOLOGY

QUESTION BANK

II YEAR

ODD SEMESTER (THIRD SEMESTER)

ACADEMIC YEAR 2024 – 2025

INDEX

HEAD OF THE DEPARTMENT

ACOE **PRINCIPAL** **CHAIRMAN**

CD3291

DATA STRUCTURES

AND

ALGORITHMS

UNIT I

ABSTRACT DATA TYPES

Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying Introduction to analysis of algorithms – asymptotic notations – divide & conquer – recursion – analyzing recursive algorithms

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Data Structures.	1	1	2
2.	What is Abstract Data type (ADT)?	1	1	2
3.	Difference between parameterised and Non-parameterised Constructors.	1	2	2
4.	What is Operator Overloading with a suitable example?	1	1	2
5.	What is Divide and Conquer Algorithm ?	1	2	2
6.	Difference between shallow and deep copying.	1	2	2
7.	Define Recursion.	1	1	2
8.	What are the types of Inheritances?	1	1	2
	PART B			
1.	Write about the analysis of algorithm and what are the common functions used in analysis of algorithm.	1	2	16
2.	What is Inheritance and explain the types with examples.	1	3	16
3.	What is asymptotic Analysis? Explain the asymptotic Notation.	1	4	16
4.	Explain the features of Object oriented programming with suitable example.	1	5	16

UNIT II

LINEAR STRUCTURES

List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – Stack ADT – Queue ADT – double-ended queues – applications.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is circular linked list and its advantages?	2	1	2
2.	What is divide and conquer algorithm and give the general recurrence of it?	2	1	2
3.	List out various the applications of stack.	2	1	2
4.	List the operations carried out in Queue.	2	1	2
5.	What is Double ended Queue?	2	1	2
6.	What is Linked List?and its Types.	2	1	2
7.	What are advantages and disadvantages of Stack.	2	1	2
8.	What are advantages and disadvantages of Queue?	2	1	2
	PART B			
1.	Explain about the circular linked list with example.	2	5	16
2.	Explain about the doubly linked list with example.	2	5	16
3.	What is Queue? List out the operations of Queue. write the implementation of Queue using Array.	2	4	16
4.	What are the advantages of linked list over array? Give the structure of Singly Linked List. What are the disadvantages of singly linked list? How to overcome it and write an algorithm for singly linked list?	2	4	16

UNIT III

SORTING AND SEARCHING

Bubble sort - Selection sort -Insertion sort -merge sort -quick sort -analysis of sorting algorithms-linear search -binary search-hashing -hash function-collision handling -load factors-rehashing and efficiency .

	Question	CO	BTL	Marks
	PART A			
1.	Difference between internal and external sorting.	3	2	2
2.	What are the steps in selection sort?	3	1	2
3.	Give the worst, best average case complexities of Linear Search.	3	1	2
4.	Define Collision in Handling.	3	1	2
5.	What is Sorting and its types of sorting.	3	1	2
6.	Explain about quick sort.	3	2	2
7.	Difference between Quick sort and Merge Sort.	3	2	2
8.	Define rehashing.	3	1	2
	PART B			
1.	Write an algorithm to perform merge sort and analyze the best case complexity of it. Apply it to sort 24, 56,47,35,10,90,82,31.	3	5	16
2.	Write an algorithm to perform quick sort and analyze the complexity of it. Apply it to sort 11,81,32,92,43,53,74.	3	5	16
3.	What is searching? Explain the linear search and binary search with python program and example.	3	5	16
4.	Given Input (4371, 1323, 6173, 4199, 4344, 9679, 1989), and a hash function h(x)=x mod 10. Do the following.	3	5	16

UNIT IV

TREES

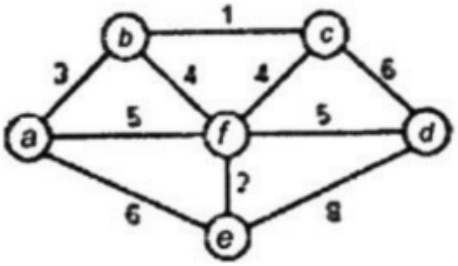
Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multiway search trees

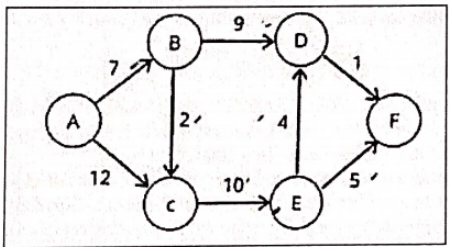
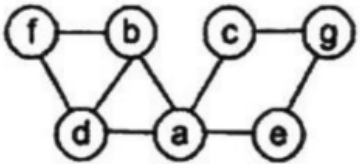
Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the properties of Binary trees.	4	1	2
2.	Define a multi way search tree.	4	1	2
3.	Difference between Binary tree and Binary Search tree.	4	2	2
4.	Define AVL Tree.	4	1	2
5.	What is Inorder Traversal?	4	1	2
6.	Define Tree ADT.	4	1	2
7.	What are the Tree Traversal techniques?	4	1	2
8.	Define Heap.	4	1	2
	PART B			
1.	Create a binary search tree for the following numbers starting from an empty binary search tree. 45, 26, 10, 60, 70, 30, 40 Delete keys 10, 60 and 45 one after the other and show the trees at each stage and write a Python program for Insertion of binary search trees.	4	6	16
2.	Create an AVL tree for the following elements in sequence 43,7,15,24,12,85,74,53.	4	6	16
3.	Explain the basic operations performed in a heap.	4	5	16
4.	What are the tree traversal techniques? Explain with an example.	4	5	16

UNIT V

GRAPH

Graph ADT – representations of graph – graph traversals – DAG – topological ordering – greedy algorithms – dynamic programming – shortest paths – minimum spanning trees – introduction to complexity classes and intractability.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define adjacency list.	5	1	2
2.	List the applications of Spanning tree.	5	1	2
3.	State greedy algorithm.	5	1	2
4.	What is DAG?	5	1	2
5.	Difference between DFS and BFS.	5	2	2
6.	What is Dynamics Programming?	5	1	2
7.	Define Graph ADT.	5	1	2
8.	Define Minimum Spanning Tree (MST)?	5	1	2
	PART B			
1.	Define Topological sort and write the procedure to do the same.	5	3	16
2.	Explain Kruskal's algorithm to find the Minimum Spanning tree for the graph and Construct a Minimum Spanning tree for the given graph. Find cost of Minimum Spanning tree. 	5	5	16
3.	**1.** Explain Dijkstra's Algorithm to find the shortest path and apply the same on the graph given below to find the shortest path from vertex A'. Analyze the time complexity of the approach.	5	5	16

				
4.	Consider the graph given below. Write down adjacent matrix and adjacent list specifying this graph.(follow in the alphabetical order of the vertex labels).Write an algorithm for traversing a graph using DFS and BFS order and apply for the given graph from vertex 'a'. What is the complexity of the algorithm when the graph is represented using i) adjacency matrix ii) adjacency list 	5	5	16

CS3351

DIGITAL PRINCIPLES

AND

COMPUTER ORGANIZATION

UNIT I

COMBINATIONAL LOGIC

Combinational Circuits – Karnaugh Map – Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder – Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers

Q.No	Question	CO	BT L	Marks
	PART A			
1.	List the four possible elementary operations simple binary addition consists of.	1	1	2
2.	Simplify the following Boolean function and draw the logic diagram. F = x'y' + xy + x'y	1	3	2
3.	Construct a full adder by using two half adders and OR gate.	1	3	2
4.	Compare the function of decoder and encoder and Convert a two-to-four-line decoder with enable input to 1:4 demultiplexer	1	2	2
5.	Draw 1:8 demultiplexer using two 1:8 demultiplexers.	1	3	2
6.	How would you design the logic diagram of a 2-bit multiplier?What is a magnitude comparator?	1	2	2
7.	The output Y of a 2-bit comparator is logic 1 whenever the 2-bit input A is greater than the 2-bit input B. What is the number of combinations for which the output is logic 1?	1	3	2
8.	Evaluate the logic circuit of a 2-bit comparator.	1	3	2
	PART B			
1.	Consider, F1 = xyz′ + wx′y′ + (x′ + z + w) (x′ + z + w′) + xyz + wx′y , F2 = xy + wx′ + x′ + z . i)Without using K-Map, show F1 can be simplified to F2 by algebraic means. (8) ii)Implement F2 using NAND gates only. Assume all variables are available in both true and complement form. (8)	1	5	16
2.	Design a 4 bit adder / subtractor circuit and explain.	1	5	16
3.	Design a 4 bit adder / subtractor circuit and explain.	1	5	16
4.	Design 4-bit magnitude comparator with three outputs: A>B, A<B and A=B.	1	5	16

UNIT II

SEQUENTIAL LOGIC

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF,Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Outline the difference between a synchronous sequential circuit and an asynchronous sequential circuit.	2	1	2
2.	How does a ripple counter differ from a synchronous counter?	2	2	2
3.	How do you eliminate the race around condition in a JK flip-flop?	2	1	2
4.	State the difference between latches and flip-flops.	2	1	2
5.	Define a latch and a FF.	2	1	2
6.	Mention the different types of shift registers.	2	1	2
7.	Define the terms: state table and state assignment.	2	1	2
8.	Differentiate Mealy and Moore state machines.	2	2	2
	PART B			
1.	Design and implementation of SR FF using NOR gate.	2	5	16
2.	Explain in detail about the 4 bit Johnson counter.	2	5	16
3.	A sequential circuit with two D FFs A and B, two inputs X and Y, and one output Z is specified by the following input equations: A (t + 1) = x'y + xA B (t + 1) = x'B + xA Z = B	2	5	16
4.	Explain the operation of a 4 bit bidirectional shift register.	2	5	16

UNIT III

COMPUTER FUNDAMENTALS

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

Q.No	Questions	CO	BTL	Marks
	PART A			
1.	What is the Von Neumann bottleneck?	3	1	2
2.	Classify the instructions based on the operations they perform and give one example of each category.	3	2	2
3.	Why are the most frequently used variables stored in registers?	3	2	2
4.	List the decision making instructions supported by MIPS assembly language.	3	1	2
5.	What is instruction set architecture?	3	2	2
6.	What do you mean by little endian?	3	2	2
7.	List the types of addressing modes.	3	1	2
8.	What are the various types of operations required for instructions?	3	2	2
	PART B			
1.	Explain the fundamental units of a stored program digital computer, along with a block diagram.	3	4	16
2.	Explain IAS architecture with the help of a neat diagram and list the instructions supported by IAS computer.	3	4	16
3.	Discuss about the instruction cycle.	3	4	16
4.	Define addressing mode. Classify addressing modes and explain in each type with examples.	3	5	16

UNIT IV

PROCESSOR

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control,Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the operations involved in instruction cycle.	4	1	2
2.	Draw the data path segment for arithmetic-logic instructions.	4	1	2
3.	What is the ideal speed-up expected in a pipelined architecture with ‘n’ stages? Justify your answer.	4	2	2
4.	What do you mean by pipelining? List its types.	4	1	2
5.	Differentiate between the static and dynamic techniques.	4	2	2
6.	What is branch hazard?	4	1	2
7.	What is meant by speculative execution?	4	1	2
8.	Differentiate data hazards and control hazards.	4	2	2
	PART B			
1.	Outline the difference between hardwired control and micro programmed control	4	4	16
2.	What is hazard? Give hazard free realization for the following Boolean functions F(A, B, C, D) = ∑m (1, 5, 6, 7) using AND-OR gate network.	4	5	16
3.	Why is branch prediction algorithm needed? Differentiate between the static and dynamic techniques.	4	4	16
4.	What are pipeline hazards? Outline the types of pipeline hazards.	4	4	16

UNIT V

MEMORY AND I/O

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is a direct-mapped cache?	5	1	2
2.	What is hit time?	5	1	2
3.	Which signal is used to notify the processor that the transfer is completed? Define.	5	1	2
4.	Mention the modes of DMA transfer.	5	1	2
5.	Outline of interrupt driven I/O.	5	2	2
6.	What is memory mapped I/O?	5	2	2
7.	Define supervisor / kernel / executive state.	5	1	2
8.	State the advantages of virtual memory?	5	2	2
	PART B			
1.	Present an outline of virtual address, physical address, address translation, segmentation, page table, swap space and page fault.	5	4	16
2.	Elucidate interconnection standards.	5	4	16
3.	Outline a direct memory access with a diagram.	5	4	16
4.	Describe the various mechanisms for accessing I/O devices.	5	4	16

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MA3354

DISCRETE MATHEMATICS

UNIT I

LOGIC AND PROOFS

PropositionalLogic–PropositionalEquivalences-PredicatesQuantifiers–Nested Quantifier–Rules of inference - Introduction to proofs–Proof Methods and strategy.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Show that ¬ (P→Q) and P∧¬Q are equivalent.	1	2	2
2.	Construct the truth table for the compound proposition (p →q)→(q→p).	1	1	2
3.	What are the negations of the statements $\forall x(x^2 > x)$ *and* $\exists x(x^2 = 2)$?	1	1	2
4.	Express the following statement using predicators and quantifiers, "All men are mortal".	1	1	2
5.	Verify P∨Q→P is a Tautology.	1	2	2
6.	Construct truth table for$(p\wedge\neg q) \rightarrow q$.	1	2	2
7.	Using truth table, show that $p \vee \neg(p \wedge q)$ is a tautology.	1	1	2
8.	Define PCNF and PDNF .	1	1	2
	PART B			
1.	Show that $P \rightarrow (Q \rightarrow R)$and $(P\wedge Q) \rightarrow R$are logically equivalent using truth table.	1	2	8
2.	Using indirect method of proof, derive $P\rightarrow\neg S$ from $P \rightarrow (Q\vee R)$, $Q\rightarrow\neg P$, $S \rightarrow\neg R$, P.	1	3	8
3.	Show that $\forall x(P(x) \rightarrow Q(x)), \forall x(R(x) \rightarrow \neg Q(x)) \Rightarrow \forall x(R(x) \rightarrow \neg P(x))$.	1	2	8
4.	Show that $(\neg P\wedge(\neg Q\wedge R))\vee(Q\wedge R)\vee(P\wedge R)\Leftrightarrow R$.	1	2	8
5.	Without constructing the truth table find the PDNF and PCNF of P→(Q∧R)∧(¬P→(¬Q∧¬R))	1	3	8
6.	Show that $p \vee (q \wedge r)$ *and* $(p \vee q) \wedge (p \vee r)$ are logically equivalent.	1	2	8
7.	Find the PDNF of the statement, $(q \vee (p \wedge r)) \wedge \neg((p \vee r) \wedge q)$.	1	3	8

UNIT II

COMBINATORICS

Mathematical Induction–Strong Induction And Well Ordering– The Basics Counting– The pigeonhole principle– Permutations And combinations–Recurrencerelations–Solving Linear recurrence relations– Generating Functions–Inclusion And exclusion principle and its applications.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Find the first four terms of the sequence defined by the recurrence relation and initial condition $a_n = a_{n-1}^2$, $a_1 = 2$.	2	1	2
2.	State the Pigeonhole principle.	2	2	2
3.	Find the recurrence relation satisfying the equation $y_n = A(3)^n + B(-4)^n$	2	1	2
4.	In how many ways can the letters of the word MISSISSIPPI be arranged?	2	1	2
5.	If 9 colours are used to paint 100 houses, show that at least 12 houses will be of the same colour.	2	1	2
6.	Solve the recurrence relation $y(k) - 8y(k-1) + 16y(k-2) = 0$ for $k \geq 2$,where y(2) = 16 and y(3) = 80 .	2	1	2
7.	If $nc_5 = 20nc_4$, find 'n'.	2	1	2
8.	In how many ways can 5 persons be selected from amongst 10 persons ?	2	2	2
	PART B			
1.	Using mathematical induction to show that $1^2 + 2^2 + 3^2 + \ldots\ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$ whenever n is a positive integer.	2	3	8
2.	Use mathematical induction to show that $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$.	2	3	8
3.	Solve the recurrence relation $a_n = 8a_{n-1} - 16a_{n-2}$ for $n \geq 2$, $a_0 = 16$, $a_1 = 80$.	2	2	8

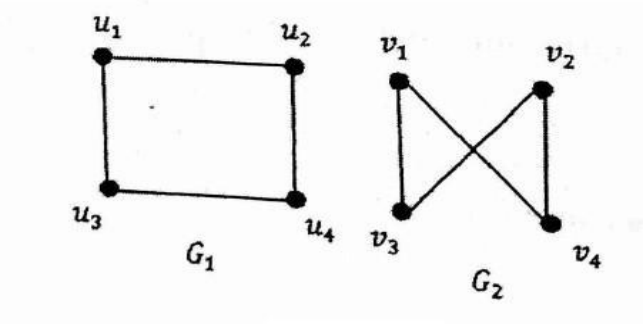
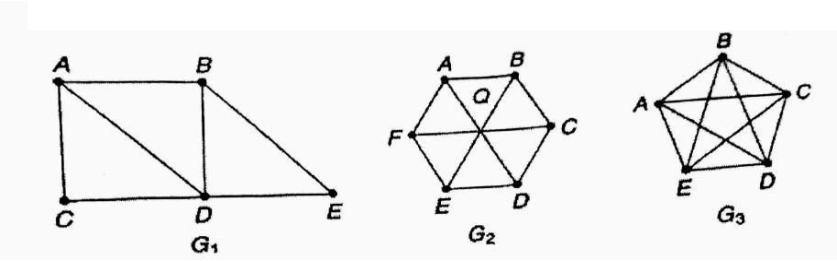
4.	Solve the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}, n \geq 2, a_0 = 2, \quad a_1 = 3.$	2	2	8
5.	In a survey of 100 students, it was found that 40 studied Mathematics, 64 studied Physics,5 studied Chemistry, 1 studied all the three subjects, 25 studied Mathematics and Physics, 3 studied Mathematics and Chemistry, 20 studied Physics and Chemistry. Use the principle of inclusion and exclusion, find the number of students who studied Chemistry only and the number who studied none of these subjects?	2	4	8
6.	From a club consisting of 6 men and 7 women, in how many ways can we select a committee of i) 3 men and 4 women ii) 4 persons which has at least one woman iii) 4 persons that has at most one man.	2	4	8

UNIT III

GRAPHS

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

PART A				
Q.No	**Question**	**CO**	**BT L**	**Marks**
1.	Define a complete graph with example.	3	1	2
2.	What is meant by simple graph? Give an example.	3	1	2
3.	Define a regular graph with example.	3	2	2
4.	State the handshaking theorem.	3	1	2
5.	Draw the graph represented by the given adjacency matrix $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$.	3	2	2
6.	Define Pseudo graph.	3	1	2
7.	Give an example of a graph which is Eulerian but not Hamiltonian.	3	1	2
8.	Draw the graph with 5 vertices A,B,C,D,E such that deg(A) = 3 , B is an odd vertex , deg(C) = 2 and D and E are adjacent.	3	2	2
PART B				
1.	In any graph G, prove that the total number of odd-degree vertices is even.	3	2	8
2.	Prove that maximum number of edges in a simple disconnected graph G with 'n' vertices and 'k' Components is $\frac{(n-k)(n-k+1)}{2}$.	3	2	16
3.	Determine whether the following graphs G1 and G2 are isomorphic.	3	4	8

				
4.	Find an Euler path or an Euler circuit, if it exists in each of the three graphs below. If it does not exist, explain why? 	3	4	8
5.	Draw thegraph with the adjacency matrix $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$ with respect to the ordering of A, B, C, D.	3	4	8

UNIT IV

ALGEBRAIC STRUCTURES

AlgebraicSystems–Semigroups A Monoids-Groups–Subgroups–Homomorphism's–Normal subgroup and cosets–Lagrange's theorem– Definition And examples of RingsandFields.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define a Ring.	4	1	2
2.	Define monoid.	4	1	2
3.	Prove that if G is abelian group then for all $a,b \in G$ $(a*b)^2 = a^2 * b^2$.	4	2	2
4.	Define a field.	4	1	2
5.	Prove that identity element is unique in a group.	4	1	2
6.	State any two properties of a group.	4	1	2
7.	Define semi groups and monoids.	4	1	2
8.	Define a commutative ring.	4	2	2
	PART B			
1.	State and prove Lagrange's theorem.	4	2	8
2.	Show that the intersection of two normal subgroup of a group (G,*) is a normal subgroup of (G,*).	4	2	8
3.	Let (G, *) be a group, then prove that (i) For each $a \in G$, $\left(a^{-1}\right)^{-1} = a$ (ii) For all, $a,\ b \in G$, $(a * b)^{-1} = b^{-1} * a^{-1}$ for all $a, b \in G$.	4	4	8
4.	Show that Kernal of a group homomorphism is a normal subgroup of the group.	4	2	16
5.	Show that the set Z_4 = { 0,1,2,3 } is a commutative ring with respect to the binary operations additive modulo	4	4	16

	$(+_4)$ and multiplicative modulo (X_4).			
6.	Show that the set of integers Z with the binary operations $\oplus$ and Θ defined by $a \oplus b = a+b-1$ and $a \Theta b = a+b-ab$ for $a, b \in Z$ is a commutative ring with identity.	4	4	16
7.	Show that the set of all non-zero real numbers is an abelian group under the operation * defined by $a * b = \frac{ab}{2}$.	4	4	8

UNIT V

LATTICES AND BOOLEAN ALGEBRA

Partialordering–Posets–Latticesasposets–Propertiesoflattices-Latticesasalgebraicsystems–Sublattices–Directproductandhomomorphism–Somespeciallattices–Booleanalgebra–Sub Boolean Algebra–BooleanHomomorphism

.No	Questions	CO	BTL	Marks
	PART A			
1.	State DeMorgan's law in Boolean Algebra.	5	1	2
2.	Draw a Hasse diagram of $D_{20} = \{1, 2, 4, 5, 10, 20\}$.	5	1	2
3.	Prove that $(a')' = a$ for all $a \in B$ where B is a Boolean Algebra.	5	1	2
4.	Draw a Hasse diagram of $D_{12} = \{1, 2, 3, 4, 6, 12\}$.	5	2	2
5.	State the distributive inequalities in Lattice.	5	1	2
6.	Define Boolean algebra.	5	2	2
7.	Define a lattice. Give a suitable example.	5	1	2
8.	Define Sub lattices.	5	2	2
	PART B			
1.	State and Prove De Morgan's law in Boolean Algebra.	5	4	8
2.	In a Boolean Algebra, prove that the following statements are equivalent. (i) $a + b = b$ (ii) $a.b = a$ (iii) $a' + b = 1$ (iv) $a.b' = 0$.	5	3	8
3.	In a Boolean Algebra show that $ab' + a'b = 0$ if and only if $a = b$.	5	3	8
4.	Prove that every chain is a distributive lattice.	5	4	8
5.	Let $(L, \leq)$ be a lattice. For any $a, b, c \in L$ the following properties called isotonicity holds. If $b \leq c$ then (i) $a * b \leq a * c$	5	3	8

	(ii) $a \oplus b \leq a \oplus c$.			
6.	Let $(L, \leq)$ be a lattice. For any $a, b, c \in L$ the following inequalities hold. (i) $a \oplus (b * c) \leq (a \oplus b) * (a \oplus c)$ (ii) $a * (b \oplus c) \geq (a * b) \oplus (a * c)$	5	4	8

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CS3391

OBJECT ORIENTED PROGRAMMING

UNIT I

Introduction To OOP And Java

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors Methods -Access specifiers – Static members- Java Doc comments

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the core OOPs concepts.	1	1	2
2.	List the various access specifiers supported by OOPS.	1	1	2
3.	Write down the characteristics of the object.	1	1	2
4.	Compare class and object.	1	2	2
5.	Define static variable and static method.	1	1	2
6.	List out the types of arrays.	1	1	2
7.	Describe Encapsulation,Inheritance,and Polymorphism.	1	2	2
8.	Illustrate constructors in java.	1	1	2
	PART B			
1.	Explain with examples passing objects as parameters to methods and returning objects from methods in Java..	1	4	16
2.	i. Explain OOPS and its features. ii.Summarize about the usage of constructors with an example using Java.	1	4	8 8
3.	i.Summarize the access specifier in Java. ii.Describe the term static fields and methods and explain its types with examples.	1	2	16
4.	Interpret with an example what is method overloading and method overriding.	1	2	16

UNIT II

INHERITANCE, PACKAGES AND INTERFACES

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Examine the importance of inheritance.	2	1	2
2.	Identify what are the two ways of using super keywords.	2	1	2
3.	Define interface and write the syntax of the interface.	2	1	2
4.	What modifiers may be used with top-level classes?	2	1	2
5.	Illustrate what is protected visibility.	2	2	2
6.	What is a default constructor? Illustrate.	2	2	2
7.	Define Package.	2	1	2
8.	Summarize any two string handling methods in Java.	2	2	2
	PART B			
1.	Explain in detail about Package with an Example Program	2	4	16
2.	i.Explain with an example, what is meant by object cloning? ii. Summarize in detail about inner class with its usefulness	2	4	8 8
3.	i.Describe in detail about inheritance. ii.Write a program for inheriting a class.	2	2	8 8
4.	Illustrate with an example how passing objects as parameters to methods and returning objects from methods in Java.	2	2	16

UNIT III

EXCEPTION HANDLING AND MULTITHREADING

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication- Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is re-throwing an expression?	3	1	2
2.	List the any five byte stream class.	3	1	2
3.	What are streams? What are their advantages?	3	1	2
4.	What are three types of I/O streams	3	2	2
5.	Define: Thread	3	1	2
6.	What are the two methods available in stack trace elements?	3	1	2
7.	Explain how to create custom exceptions.	3	2	2
8.	Differentiate exception and error.	3	1	2
	PART B			
1.	Explain the following in detail with example program. i.Checked Exception. ii.Unchecked exception.	3	4	16
2.	Explain the following with example i. Reading console input ii. Writing console output.	3	4	8 8
3.	Discuss in detail about exception handling constructs and write a program to illustrate Divide by zero exception .	3	2	16
4.	Explain in detail about Thread and its types.	3	2	16

UNIT IV

I/O, GENERICS, STRING HANDLING

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Why is synchronization required in thread?	4	1	2
2.	What is the need for thread?	4	1	2
3.	Define multithreading	4	1	2
4.	Give the properties of thread.	4	2	2
5.	Write down the need for generic programming.	4	1	2
6.	List the importance of thread constructors.	4	1	2
7.	Give the methods used for inter thread communication.	4	2	2
8.	Summarize the advantages of generic programming.	4	1	2
	PART B			
1.	Assess an example program in Java on how to implement bounded types (extend superclass) with generics.	4	3	16
2.	Explain in detail about multi thread programming with examples.	4	4	16
3.	I.Differentiate multithreading and multitasking. ii.Describe the properties of thread in detail.	4	3	8 8
4.	Illustrate a program to perform string operations using ArrayList. Write functions for the following. Append - add at end. Insert – add at particular index Search. List all string starts with given letter “a”.	4	2	16

UNIT V

JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – MenuItem.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the features of Swing.	5	1	2
2.	List out some system colors available in Java and their purpose.	5	1	2
3.	Name any four events of a button component.	5	1	2
4.	Differentiate between a Choice and a List.	5	2	2
5.	List the difference between scrollbar and scroll pane.	5	1	2
6.	Give the steps needed to show a Frame.	5	2	2
7.	Show what method can be used for changing font of characters?	5	2	2
8.	Quote how can you create your own GUI components?	5	1	2
	PART B			
1.	Illustrate a Java program to implement the following Create four checkboxes. The initial state of the first box should be in the checked state. The status of each check should be displayed. When we change the state of a check box, the status should be displayed and updated	5	2	16
2.	i..Describe in detail about swing Components. ii.Describe the types of layout management. Summarize in detail about graphics programming.	5	4	8 8

3.	Explain how an application can respond to events in Java? Write the steps and the example.	5	2	16
4.	Recommend a Java swing with one button and add it on the JFrame object inside the main() method.	5	3	16

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CS3352

FOUNDATIONS OF DATA SCIENCE

UNIT I

INTRODUCTION

Introduction: Data Science: Benefits and uses – facets of data – Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation – Exploratory Data analysis – build the model– presenting findings and building applications – Data Mining – Data Warehousing – Basic Statistical descriptions of Data.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Difference Between data warehouse and data mining.	1	2	2
2.	List the facets,application and uses of data science.	1	2	2
3.	What is the difference between Data science and BigData?	1	1	2
4.	Define Data Science and KDD.	1	1	2
5.	List the three sub phases in data preparation.	1	2	2
6.	What are external and internal data?	1	2	2
7.	List the steps involved in building a model.	1	2	2
8.	Define a Data Warehouse and list the characteristics.	1	1	2
	PART B			
1.	Explain the data science process in detail with a neat sketch.	1	4	16
2.	Explain the components of the data warehouse and its functions in detail.	1	4	16
3.	Explain about data preparation process in detail	1	4	16
4.	Explain about data exploratory analysis.	1	4	16

UNIT II

DESCRIBING DATA

Types of data -Types of variables-Describing Data wit tables and graphs -Describing Dta with Averages -Describing Variability -Normal Distribution and Standard (z)Scores.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are the types of data?	2	1	2
2.	List out the types of variables.	2	2	2
3.	Define variability.	2	1	2
4.	What is meant by normal distribution?	2	1	2
5.	Define standard (z) scores.	2	1	2
6.	What are standard errors?	2	1	2
7.	Difference between bar chart and histogram.	2	2	2
8.	Write the application of the normal distribution.	2	1	2
	PART B			
1.	Explain mean ,median and mode with proper example.Shorts notes on range and variance.	2	4	16
2.	How to find the standard deviation of a given data 3,5,7 with a sample mean is 5.	2	4	16
3.	Write short notes on Normal distribution.To find a Z-score for which the area to the right is 5%:Since the table is cumulative from the left, you must use the complement of 5%.	2	4	16
4.	Explain about Describing Data with Tables and Graphs with a neat example.	2	4	16

UNIT III

DISTRIBUTED RELATIONSHIPS

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is Correlation and Regression?	3	1	2
2.	Define Least Square Regression Line.	3	1	2
3.	Define Standard Error of Estimate.	3	1	2
4.	What is Multiple regression?Benefits of Multiple Regression Equations?	3	1	2
5.	What does a correlation coefficient tell you?Significance of correlation coefficient?	3	1	2
6.	List the types of Correlation coefficients.	3	2	2
7.	What are the assumptions our data has to meet for pearson's?	3	1	2
8.	Give Pearson's r formula with explanation.Give Spearman's rho formula.	3	2	2
	PART B			
1.	Explain about types of Correlation coefficients with examples and summarize data and help you compare results between studies.	3	4	16
2.	Find the least squares regression line for the five-point data set and verify that it fits the data better than the line y2=12x−1 considered"Goodnessof Fit of a Straight Line to Data".	3	4	16
3.	Explain Types of regression, regression line,least square regression line, standard error of estimates in detail with example.	3	4	16
4.	Explain scatter plots with examples and How to interpret scatterplots.	3	4	16

UNIT IV

PYTHON LIBRARIES FOR DATA WRANGLING

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables..

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are Comparisons, Masks, and Boolean Logic?	4	1	2
2.	Write about the Pandas Data Frame Object?	4	2	2
3.	What is Hierarchical Indexing?	4	1	2
4.	Define Pivot Tables.	4	2	2
5.	HowtoCreateStructuredArrays.	4	2	2
6.	Write about Simple Aggregation Pandas.	4	1	2
7.	Define Data manipulation.	4	1	2
8.	Define aggregation and grouping.	4	1	2
	PART B			
1.	Explain in detail about Combining Datasets: Merge and Join Relational Algebra with examples.	1	4	16
2.	Explain Computation on NumPy Array in detail with example programs.	1	4	16
3.	Explain about comparisons,masks,boolean logic – fancy indexing – structured arrays.	1	3	16
4.	Explain about Data manipulation with Pandas.	1	5	16

UNIT V

DATA VISUALIZATION

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting – Geographic Data with Basemap – Visualization with Seaborn.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is Python Matplotlib and its uses?	5	2	2
2.	Is Matplotlib Included in Python?	5	1	2
3.	Write matplotlib function to draw a simple histogram.	5	1	2
4.	Creating a simple Graph and Adding Some error in y value.	5	1	2
5.	Define Visualizing Errors.	5	2	2
6.	What is seaborn?	5	1	2
7.	Define Three-DimensionalPlotting.	5	2	2
8.	What are map projections?	5	1	2
	PART B			
1.	Explain about Geographic Data with Basemap with an example program.	5	4	16
2.	Explain about Seaborn Versus Matplotlib Exploring Seaborn Plots with example programs.	5	4	16
3.	Explain about Text and Annotation with example programs.	5	4	16
4.	Explain Three-Dimensional Plotting in Matplotlib with example programs.Explain about Describe Visualizing Errors in detail.	5	4	16

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