

Maximum Marks: 100	Semester: July 2023-October 2023	Duration: 3 Hrs.
Programme code: 04	Examination: ESE	
Programme: B. Tech Information Technology	Class: SY	Semester: III (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04C301	Name of the Course: Discrete and Applied Mathematics	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four of the following	20
i)	If $A = \{2, 3, 4, 5, 6, 7, 8, 9\}$ and relation R is defined as aRb if a divides b then (i) Write R as set of ordered pairs (ii) Write Matrix of R (iii) Determine whether the relation R is symmetric or transitive.	5
ii)	Check whether given graph is bipartite or complete bipartite? Justify your answer. Draw the graph again showing the partition if it is bipartite.	5
iii)	Find Laplace transform of $te^{-4t} \sin 3t$	5
iv)	Prove that A is a group with respect to * Where $A = R - \{1\}$ the set of real numbers except 1 and $a * b = a + b - ab$	5
v)	Show that function f is bijective (One-one and onto) and find f^{-1} where $f: R - \left\{\frac{2}{5}\right\} \rightarrow R - \left\{\frac{4}{5}\right\}, f(x) = \frac{4x-3}{5x-2}$	5
vi)	Check whether function is Even/odd and Find Fourier series for $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi}, & 0 \leq x \leq \pi \end{cases}$	5
Q2 A	Solve the following	10
i)	For the given graph, Solve travelling salesperson problem by taking D as the starting vertex. Also find the length of minimum Hamiltonian circuit.	5
ii)	If 10 points are chosen lying on or inside an equilateral triangle whose sides are of length 3 units, then show that at least two of them are less than 1 unit apart, by using pigeonhole principle.	5
OR		
Q2 A	Obtain complex form of Fourier series for $f(x) = e^{-x}$ in $(-1, 1)$	10
Q2 B	Solve any One of the following	10
i)	Using convolution theorem find inverse Laplace transform of $\frac{1}{(s+3)(s^2+2s+2)}$	10
ii)	Prepare Cayley table with respect to multiplication modulo 5 for $S = Z_5 - \{0\}$. Determine whether S is Semi-group, Monoid or Group? Is it commutative?	10

Q3	Solve any Two of the following	20
i)	(a) Evaluate using Laplace transform $\int_0^\infty e^{-2t} \frac{\sinh t \sin t}{t} dt$ (b) Express the function as Heaviside's unit step function and find its Laplace transform, where $f(t) = \begin{cases} 2t, & 0 < t < 1 \\ 3t^2, & t > 1 \end{cases}$	05
ii)	If $A = \{1, 2, 3, \dots, 12\}$ and R is the relation defined by $x \equiv y \text{ mod}(4)$ then write R as a set of ordered pairs and Check that it is an equivalence relation. Write elements of each equivalence class and also find the partition of A induced by R	10
iii)	Find the Fourier series of $f(x) = x \sin x$, $0 < x < 2\pi$. Hence deduce that $\sum_{n=2}^{\infty} \frac{1}{n^2 - 1} = \frac{3}{4}$	10
Q4	Solve any Two of the following	20
i)	Find maximum and minimum height of binary tree with 11 vertices. Using the given Huffman tree encode the words (i) ROAD (ii) DOOR and decode the messages (i) 00 110 010 011 10 (ii) 10 110 00 010 011 10	10
ii)	Find the Fourier series of $f(x) = x^2$, $0 < x < 2$. Hence deduce that $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots$	10
iii)	Solve using Laplace Transform $(D^2 - 3D + 2)y = 4e^{2t}$ with $y(0) = -3$ and $y'(0) = 5$	10
Q5	Solve any Four of the following	20
i)	Check whether given graphs are isomorphic or not? Justify your answer. Write the isomorphism if they are isomorphic	5
ii)	If $A = \{1, 2, 3, 4\}$, Relations $R = \{(1,2), (1,3), (2,2), (2,3), (2,4), (3,2), (4,3)\}$ and $S = \{(1,3), (2,1), (2,4), (3,1), (3,2), (4,2)\}$ then find R^{-1} , SoR and RoS	5
iii)	Find inverse Laplace transform of $\cot^{-1}\left(\frac{4}{s}\right)$	5
iv)	Functions $f: R \rightarrow R$, $g: R \rightarrow R$ are defined as $f(x) = 2x + 3$, $g(x) = 3x - 4$ then find fog , f^{-1} and g^{-1}	5
v)	Find all zero divisors and units for ring Z_{12} , Justify your answer.	5
vi)	Find half range cosine series for $f(x) = x(\pi - x)$, $0 < x < \pi$	5

30.11.2023 (E)



Maximum Marks: 100	Semester: July 2023 –October 2023 Examination: ESE Examination	Duration: 3 Hrs.
Programme code: _04 Programme: BTech	Class: SY	Semester: _III_(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT / Comp	
Course Code: 116U04C302 Name of the Course: Data Structures		
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

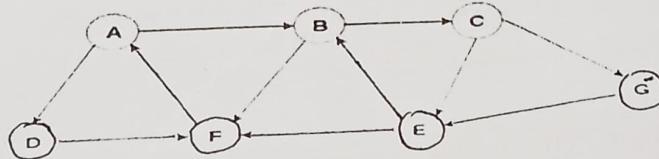
Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	What is ADT (Abstract Data Type)? What are the advantages of ADT?	5
ii)	What is data structure? List the data structures classified based on its type of data structure.	5
iii)	Differentiate between array and linked list (5 valid points)	5
iv)	What is complete binary tree? Explain BFS (Breadth First Search) on complete binary tree with the help of suitable example.	5
v)	Differentiate between map and dictionary data structure (5 valid points)	5
vi)	Sort following numbers using counting sort – 3, 5, 4, 7, 3, 4, 7, 2, 8, 2, 3	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Convert following prefix to infix form using stack (show all steps clearly) / * / + + a - b c + d e f g h	5
ii)	Write pseudocode to implement linear queue ADT functions. OR	5
Q2 A	Write pseudocode for converting infix expression to postfix form. Also write the pseudocode/algorithm for the data structure used in conversion.	10
Q 2 B	Solve any One	10
i)	Explain following circular singly linked list operations with the help of block diagrams 1) Insert_at_end 2) Delete_after 3) Search a given number	10
ii)	Explain following doubly linked list operations with the help of block diagrams 1) Insert_before a node 2) Delete_before 3) Display all numbers	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Write the algorithm to construct a BST from given postorder and inorder traversal. Apply the same and construct BST using following Postorder traversal: 1 , 6, 8, 9, 7, 11, 13, 15, 12, 10 Inorder traversal: 1, 6 ,7, 8, 9, 10, 11, 12, 13, 15	10
ii)	State the need of height balanced trees. Insert following numbers in the given order on an initially empty AVL tree. Clearly specify the necessary information at each insertion. 20,10,30,40,50,60,25,21,55,58	10
iii)	Explain B-Tree with the help of an example. Show all the cases of insertion operations on the B-Tree.	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	State the properties of a good hash function. Hash the following number in a hash table of size 9 using standard modulus hash function. Resolve the collisions using linear probing. 3, 2, 9, 6, 11, 13, 7, 12, 18	10
ii)	Write the pseudocode for binary search. Apply the same on following set of numbers to search for 52. 12,25,31,40,44,45,52,56,67,82	10
iii)	Write the pseudocode for insertion sort. Apply the same on following set of numbers (show all the steps clearly) 40,25,12,52,44,82,31,67,45,56	10

Que. No.	Question	Max. Marks
Q5	Attempt any four	20
i)	Differentiate between static implementation and dynamic implementation.	5
ii)	Explain the use of linked list for polynomial representation.	5
iii)	Differentiate between circular queue and priority queue (5 valid points).	5
iv)	Consider the following graph and represent the same using adjacency matrix and adjacency list.	5
v)	Write dictionary ADT.	5
vi)	Write short note on applications of set data structure.	5





Maximum Marks: 100	Semester: July 2023 –October 2023 Examination: ESE Examination	Duration: 3 Hrs.
Programme code: 04	Class: Sy	Semester: III (SVU 2020)
Programme: BTech in IT		
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: IT
Course Code: 116U04C303	Name of the Course: Database Management Systems	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Draw three tier architecture of database system and explain in brief.	5
ii)	What is the role of DBA?	5
iii)	What is data model? Explain different types of data models.	5
iv)	How database system is different from traditional file system?	5
v)	What are different phases of database design? Explain ,	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	How will you summarize the following relationship in entity sets. You may consider the set of attributes for each entity set for explanation.	5
	<pre> graph TD Staff[Staff] --- ISA((ISA)) ISA --- Nurse[Nurse] ISA --- Doctor[Doctor] </pre>	
ii)	What is cardinality and participation constraints in ER model? Explain with proper example.	5
	OR	
Q2 A	The university maintains information about various departments, courses, students, and instructors. One department has many instructors. Many students are admitted in each department. Many courses are conducted by each	10

department. Many such courses are conducted in each classroom. Students register for many courses and each instructor teaches many courses. Find out the entity sets and relationship sets. For each entity set take minimum four attributes and a primary key.
 Draw ER diagram and reduce it to relational model.

10

10

Q 2 B Solve any One

i) Consider a following relation?

P(eno, name, dob, gender, DOJ, basicpay, dept_no).

Illustrate an SQL queries

- Count total number of female employees working in company.
- Display eno, name and basic pay of all the employees who joined before '31/10/2019'.
- Display eno, name and DOJ of all the employees whose name start with letter 'M' and ends with letter 't'.
- Display all details of the employees who draw basic pay in the range of 30000 to 60000.
- To find and display the average basicpay in each dept using renaming in sql to name the new column as avg_basicpay.

ii) Consider following relational schema
 (primary is displayed in bold)

10

branch(branch **name**, branch city, assets)

customer (customer **name**, customer street, customer city)

loan (**loan number**, branch name, amount)

borrower (customer **name**, **loan number**)

account (**account number**, branch name, balance)

depositor (customer **name**, **account number**)

Give an expression in the relational algebra for each of the following queries.

a. Find the names of all branches located in "Chicago".

b. Find the names of all borrowers who have a loan in branch "Downtown".

c. Find all loan numbers with a loan value greater than \$10,000.

d. Find the names of all depositors who have an account with a value greater than \$6,000 at the "Uptown" branch.

e. Display list of customer cities without redundant information.

Que. No.

Question

Max. Marks

20

10

Q3 Solve any Two

i) Given the following relation for published books:

BOOK(Book_title, Authorname, Book_type, Listprice, Author_affil, Publisher)
 (Author_affil refers to the affiliation of author.)

Suppose the following dependencies exist in relation BOOK:

Book_title → Publisher, Book_type

Book_type → Listprice

Authorname → Author_affil

a. Find keys of the relation

b. What normal form is the relation in? Explain your answer.

	c. Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.																																					
ii)	What is indexing? Explain what is dense index and how is it helpful in data access. List its merit and demerits.	10																																				
iii)	Why hashing is used in database storage? Explain concept of static hashing. List the disadvantages of same.	10																																				
Que. No.	Question	Max. Marks																																				
Q4	Solve any Two	20																																				
i)	Explain two-phase locking protocol and its two variants. Draw diagrams to explain.	10																																				
ii)	What is conflict serializability? Is the following schedule conflict serializable? Test using precedence graphs and explain in detail. <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>T1</td><td>T2</td><td>T3</td></tr> <tr><td>Read(A)</td><td></td><td></td></tr> <tr><td></td><td>Read(B)</td><td></td></tr> <tr><td></td><td></td><td>Read(C)</td></tr> <tr><td></td><td>Write(B)</td><td></td></tr> <tr><td></td><td></td><td>Write(C)</td></tr> <tr><td>Write(A)</td><td></td><td></td></tr> <tr><td></td><td>Read(A)</td><td></td></tr> <tr><td>Read (C)</td><td></td><td></td></tr> <tr><td></td><td>Write(A)</td><td></td></tr> <tr><td>Write(A)</td><td></td><td></td></tr> <tr><td></td><td></td><td>Write(B)</td></tr> </table>	T1	T2	T3	Read(A)				Read(B)				Read(C)		Write(B)				Write(C)	Write(A)				Read(A)		Read (C)				Write(A)		Write(A)					Write(B)	10
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iii)	What is deadlock in database? Explain the strategies for deadlock prevention, detection and recovery.	10																																				

Que. No.	Question	Max. Marks
Q5	Write <u>short note</u> on any four	20
i)	Multilevel indexing	5
ii)	Sparse indexing	5
iii)	3NF vs BCNF	5
iv)	Need for functional dependencies	5
v)	Dynamic hashing	5
vi)	Steps involved in query processing	5

Maximum Marks: 100	Semester: July 2023 –October 2023 Examination: ESE Examination	Duration: 3 Hrs.
Programme code: 04		
Programme: BTech <u>IT</u>	Class: SY	Semester: III(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Information Technology	
Course Code: 116U03C304	Name of the Course: Digital Systems	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	
i)	Convert $(20)_{10}$ to Binary, Hexadecimal, Octal, BCD and Gray code.	20
ii)	Use Binary arithmetic rules to solve $(11110000) + (00011111)$	5
iii)	Solve using 2's complement method (8 bit representation) : $(12)_{10} - (22)_{10}$	5
iv)	Solve using BCD arithmetic rules- $(58)_{10} + (12)_{10}$	5
v)	Realize AND gate using NOR gate, justify your design using truth table method.	5
vi)	Represent the given expression in Canonical form: $Y = A'B + AB'C + C$	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	
i)	Find out the simplified expression using K map method- $Y = \pi M(0,2,8,10,11,14,15).d(1,5,9,13)$	10
ii)	Realize the minimized expression obtained in above example (Q2A-i) using basic logic gates as well as any one type of universal gates.	5
	OR	
Q2 A	Design a 4 bit Ripple carry adder using full or half adder blocks. Label the circuit and explain the working using example $(1001)_2 + (1001)_2$	10
Q 2 B	Solve any One	
i)	Draw logic diagram of 2:1 multiplexer and 1:2 Demultiplexer using Logic gates, write the truthtables as well as output expressions for both.	10
ii)	Design 4 bit Binary to BCD code converter using suitable Demultiplexer.	10

Que. No.	Question	Max. Marks
Q3	Solve any Two (write stepwise solutions)	
i)	Design synchronous Mod 4 up counter using JK flipflops and draw the timing diagram.	20
ii)	Design asynchronous Decade counter using T flipflops.	10
iii)	Design synchronous 2 bit up down counter using D flip flops.	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Explain Von Neumann architecture with the help of neat diagram.	10
ii)	Explain interrupt handling in computer with the help of diagram.	10
iii)	Draw SRAM and DRAM cell structure, compare SRAM and DRAM.	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Explain Bus Interface Unit of 8086.	5
ii)	Explain Execution unit of 8086.	5
iii)	List any 4 addressing modes of 8086, Give examples of Assembly language commands of any two addressing modes with justification.	5
iv)	Calculate the physical address of 8086 if number stored in CS is 000Fh and number stored in IP is 000Fh.	5
v)	Write a note on Interleaved Memory architecture in 8086.	5
vi)	State and draw types of Shift registers	5

Maximum Marks: 100	Semester: July 2023 –October 2023 Examination: ESE Examination	Duration: 3 Hrs.
Programme code: 04 Programme: B. Tech Information Technology	Class: SY	Semester: III (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04C305 Name of the Course: Data Communication and Networking		
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Differences between ISO-OSI and TCP IP models. (Any five valid points)	5
ii)	What is the difference between Network layer and Transport layer delivery?	5
iii)	Describe Peer to Peer paradigm with neat diagram and examples.	5
iv)	Explain Leaky bucket shaping algorithm.	5
v)	Explain Go-Back-N ARQ.	5
vi)	Explain three guided media, give one application and typical data rate for each.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Draw neat diagram and explain iterative resolution.	5
ii)	Draw and explain FTP with all components.	5
	OR	
Q2 A	Explain Nonpersistent V/S Persistent HTTP connections with suitable diagram? Also write the formats of the request and response messages.	10
Q 2 B	Solve any One	10
i)	What is congestion control? How it is different from flow control? Explain any four congestion prevention techniques.	10
ii)	Compare the TCP and UDP protocols (any four points). Define the six control bits or flags in TCP. What is their purpose?	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	
i)	A block of addresses is granted to a small organization. One of the address is 205.16.37.40/28. What is the first address, last address and the number of addresses in the block. For the same IP in classful addressing scheme identify the class and network address.	20
ii)	What are the advantages of IPv6 over IPv4 (any 4 points). Also explain IPv4 to IPv6 transition strategies in detail.	10
iii)	What are the three main functions performed by network layer? What is routing? Explain Distance vector routing with an example.	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	A Slotted ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces a) 1000 frames per second b) 500 frames per second c) 250 frames per second	10
ii)	Draw neat waveforms (with proper alignment of bit duration) for the 01110010 in each of the following methods: a) Unipolar b) RZ c) NRZ_L d) Manchester e) Differential Manchester	10
iii)	Define Analog to Analog conversion? Explain all three conversion methods with suitable example.	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Define minimum hamming distance. Find the minimum Hamming distance for the given code words: 00000, 01011, 10101, 11110	5
ii)	Describe MIME headers with suitable example.	5
iii)	Explain stream delivery service in TCP?	5
iv)	Draw and explain Datagram approach of packet switching.	5
v)	CRC detection with suitable example. <u>Explain</u> .	5
vi)	Draw and explain the frame structure of HDLC.	5

03/06/2024 (E)

Maximum Marks: 100	Semester: January 2024 –April 2024 Examination: ESE Examination (KT)	Duration: 3 Hrs.
Programme code: 04	Class: SY	Semester: III (SVU 2020)
Programme: B. Tech Information Technology		
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04C305 Name of the Course: Data Communication and Networking		
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Difference between OSI V/S TCP/IP models . (Any 5 valid points)	5
ii)	Define Topology. Explain Ring and Mesh topologies with their disadvantages.	5
iii)	Explain any five factors that determine whether a communication system is LAN or MAN.	5
iv)	Describe Client Server paradigm with neat diagram and examples.	5
v)	Describe what are the three domains of the DNS .	5
vi)	What is a URL and what are its components? Give an example to interpret the same.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Draw neat diagram and explain recursive resolution.	5
ii)	Draw and explain FTP with all components.	5
	OR	
Q2 A	Alice and Bob are connected to their organization mail server via LAN or WAN. Alice wants to send a mail to Bob over the internet. Draw neat diagram for Email architecture showing one way email exchange with proper labelling. Explain the architecture, specifically the application programs/protocol used at various stages.	10
Q 2 B	Solve any One	10
i)	Compare the TCP and UDP header (any six points). List any two fields in the TCP header that are missing from UDP header. Give the reasons for their absence.	10
ii)	What is Congestion? List the different open loop and closed loop congestion control policies. Explain any one in each category.	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Draw neatly IPV4 datagram format. An IP Packet has arrived with the first few hexadecimal digits as shown below: 45000028000100000106 (a) What is the header length? (b) How many hops can this packet travel? (c) What is the upper layer protocol? (d) What is the total number of bytes in the header?	10
ii)	What are the three main functions performed by network layer? What is routing? Explain Link state routing with an example.	10
iii)	What is QoS in internetworking? What are the four techniques to improve the quality of service.	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	A Pure ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces (a) 1000 frames per second (b) 500 frames per second (c) 250 frames per second	10
ii)	Draw neat waveforms (with proper alignment of bit duration) for the 101011100 in each of the following methods: a) Unipolar b) RZ c) NRZ_L d) Manchester e) Differential Manchester	10
iii)	Explain any two guided and three unguided medium with their advantages and disadvantages.	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Difference between Subnetting and Supernetting .	5
ii)	Draw and explain Datagram approach of packet switching.	5
iii)	Explain Leaky bucket shaping algorithm.	5
iv)	Explain HDLC protocol.	5
v)	Explain Go-Back-N ARQ.	5
vi)	Explain checksum error detection method with suitable example.	5

2/2

09. 12. 2023 (E)

Maximum Marks: 100	Semester: July 2023 – October 2023 Examination: ESE Examination	Duration: 3 Hrs.
Programme code: EC		
Programme: B. Tech IT- Honor in AI	Class: S.Y.	Semester: III (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Information Technology	
Course Code: 116h66C301	Name of the Course: Fundamentals of Data Science	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	What are different types of data attributes?	5
ii)	Why to study Exploratory Data Analysis over Conventional Data Analysis?	5
iii)	List out steps needed to transform the data so that data suitable for mining?	5
iv)	What are the general characteristics of datasets?	5
v)	What are the different data quality issues?	5
vi)	Compare supervised and unsupervised learning use in data science.	5

Que. No.	Question	Max. Marks																		
Q2 A	Solve the following	10																		
i)	Compute mean , mode , median , standard deviation and range for data given below? Data Set: 12, 15, 7, 9, 12, 15, 22, 18, 7, 9	5																		
ii)	Given two binary strings A and B of equal length: A = "1010101" B = "1001101" Calculate the Hamming distance between strings A and B. OR	5																		
Q2 A	What is Mahalonobis distance ? Compute the Mahalonobis distance for the person (6,30,4), who is away from data?	10																		
	<table border="1"> <thead> <tr> <th>X-Height</th> <th>Y -Score</th> <th>Z Age</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>10</td> <td>2</td> </tr> <tr> <td>4</td> <td>20</td> <td>3</td> </tr> <tr> <td>5</td> <td>30</td> <td>4</td> </tr> <tr> <td>6</td> <td>40</td> <td>5</td> </tr> <tr> <td>7</td> <td>30</td> <td>6</td> </tr> </tbody> </table>	X-Height	Y -Score	Z Age	3	10	2	4	20	3	5	30	4	6	40	5	7	30	6	
X-Height	Y -Score	Z Age																		
3	10	2																		
4	20	3																		
5	30	4																		
6	40	5																		
7	30	6																		
Q 2 B	Solve any One	10																		
i)	Predict the following missing data using interpolation technique? <table border="1"> <thead> <tr> <th>Time(Hours)</th> <th>Temperature (0C)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>20</td> </tr> <tr> <td>1</td> <td>?</td> </tr> <tr> <td>2</td> <td>24</td> </tr> <tr> <td>3</td> <td>26</td> </tr> </tbody> </table>	Time(Hours)	Temperature (0C)	0	20	1	?	2	24	3	26	10								
Time(Hours)	Temperature (0C)																			
0	20																			
1	?																			
2	24																			
3	26																			
ii)	Calculate central moments for a given dataset [10,20,30,40,50]?	10																		

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Compare the symmetric and asymmetric binary data? Compute simple matching coefficient for given data ,where two binary vectors A and B which given as follows: A = [1, 0, 1, 1, 0] B = [0, 1, 1, 0, 1]	10
ii)	Consider two variables, X and Y, and you have a dataset of their values: X: [10, 20, 30, 40, 50] Y: [5, 15, 25, 35, 45] Calculate the covariance and Pearson coefficient of correlation ?	10
iii)	What is the Jaccard and N Gram Textual similarity? What are its applications? Compute the Jaccard similarity for bigrams (N=2)? The given data two text documents: Document A: "Machine learning is fascinating." Document B: "Artificial intelligence is amazing."	10

Que. No.	Question	Max. Marks																						
Q4	Solve any Two	20																						
i)	Normalize the student examination scores using three different techniques: Min-Max normalization, z-score normalization, and Decimal scaling? <table border="1"> <tr> <td>Student Roll No</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> </tr> <tr> <td>Marks</td> <td>85</td> <td>92</td> <td>78</td> <td>88</td> <td>96</td> <td>75</td> <td>82</td> <td>90</td> <td>79</td> <td>94</td> </tr> </table>	Student Roll No	1	2	3	4	5	6	7	8	9	10	Marks	85	92	78	88	96	75	82	90	79	94	10
Student Roll No	1	2	3	4	5	6	7	8	9	10														
Marks	85	92	78	88	96	75	82	90	79	94														
ii)	What is an outlier? What are the methods to detect outliers? Find the outlier for any sample data using one of the method?	10																						
iii)	Find out final cluster for the persons datasets. The table shows data with the two features (Age and IQ Level) of person <table border="1"> <tr> <td>Person</td> <td>A</td> <td>B</td> <td>C</td> <td>D</td> <td>E</td> <td>F</td> </tr> <tr> <td>Age</td> <td>2</td> <td>3</td> <td>5</td> <td>6</td> <td>8</td> <td>2</td> </tr> <tr> <td>IQ Level</td> <td>3</td> <td>2</td> <td>8</td> <td>7</td> <td>5</td> <td>6</td> </tr> </table> Initial cluster points given are c1=(3,3) and c2=(7,7)	Person	A	B	C	D	E	F	Age	2	3	5	6	8	2	IQ Level	3	2	8	7	5	6	10	
Person	A	B	C	D	E	F																		
Age	2	3	5	6	8	2																		
IQ Level	3	2	8	7	5	6																		

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Prepare bar chart for the data given below: Product Category Sales (in thousands) ----- Electronics 250 Clothing 180 Home Appliances 120 Books 90 Toys 150	5
ii)	What are the differences between a scoreboard and a dashboard in data visualization?	5
iii)	What are the differences between graphs and charts in data visualization?	5
iv)	Write a short note on icon based visualization techniques.	5
v)	Write short note on any one Data Visualization and Analysis Tool.	5
vi)	Write a short note on Pixel Based Visualization.	5