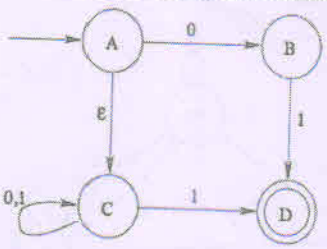
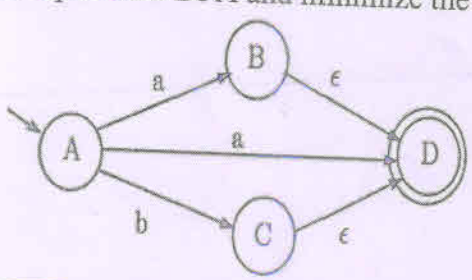
SOMAIYA VIDYAVIHAR UNIVERSITY

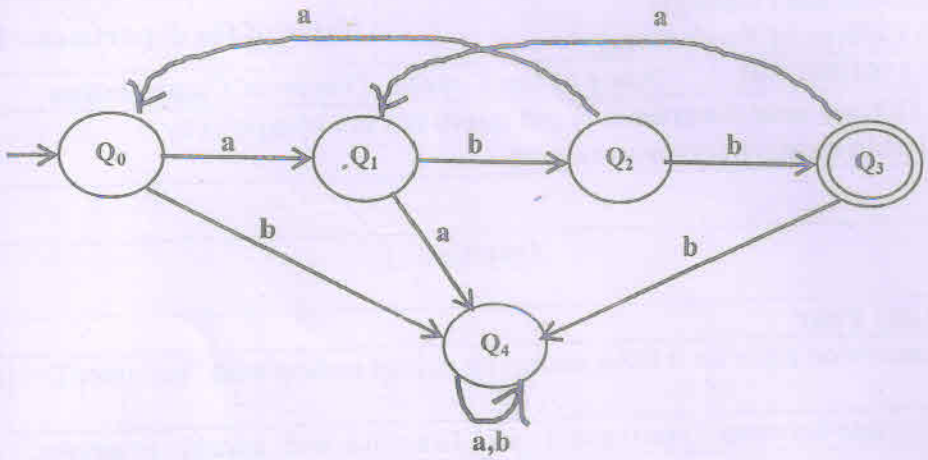
06-06-2023 (E)

Semester: January 2023 – May 2023		
Maximum Marks: 100	Examination: ESE Examination – KT	Duration:3 Hrs.
Programme code: 04 Programme: BTech IT	Class: TY	Semester: V(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04C501	Name of the Course: Theory of Computation	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

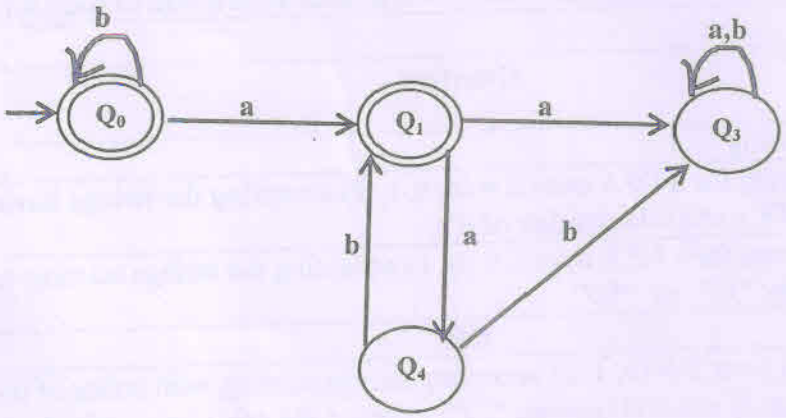
Que. No.	Question	Max. Marks
Q1	Solve any **Four**	20
i)	Give transition table for a DFA accepting strings ending with "ba" over Σ = (a, b)	5
ii)	Differentiate between Type 0 and Type 1 Grammar with suitable examples	5
iii)	Give state diagram for ε-NFA accepting L.L={"a", "ab", "acb", "abb", "acbb"} along with it's formal definition	5
iv)	With neat diagram, list components of Turing Machine and their role	5
v)	Compare normal forms of Context Free Grammar	5
vi)	Give formal definition of Pushdown Automata with description of each tuple	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Give state diagram for a DFA over Σ = (a, b, c, d) accepting the strings having even number of a's and odd number of d's	5
ii)	Give state diagram for a NFA over Σ = (0, 1) accepting the strings starting with "01" followed by "11" or "00"	5
	OR	
Q2 A	Design a ε-NFA over Σ = (0, 1, 2) accepting strings starting with either of the symbol (0 or 1 or 2) and ending with "22". Convert the same into equivalent DFA.	10
Q 2 B	Solve any **One**	10
i)	Convert the given into equivalent DFA and minimize the same 	10
ii)	Convert the given into equivalent DFA and minimize the same 	10

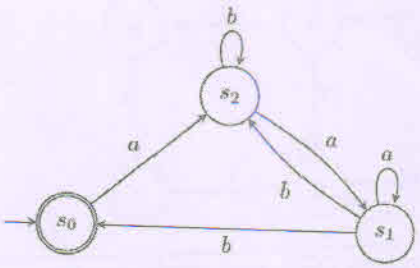
Que. No.	Question	Max. Marks
Q3	Solve any **Two**	20
i)	Find equivalent regular expression for the given with State Elimination Method	10



ii)	Find equivalent regular expression for the given with method using Arden's lemma	10



iii)	State and prove Arden's Theorem. Derive equivalent RE for the given DFA with method using Arden's Lemma	10



Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Convert to GNF S → aXbX X → aY | bY | ε Y → X | c	10
ii)	Convert to CNF A → BAB | B | ε B → 00 | ε	10
iii)	Convert to CNF S ⇒ ASB A ⇒ aASA | a | ε B ⇒ SbS | A | bb	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any **four**	20
i)	Chomsky Hierarchy	5
ii)	Hilbert's Problems	5
iii)	Variations of Turing Machine	5
iv)	An Undecidable Problem That is RE	5
v)	Decidable Languages	5
vi)	Halting Problem	5

SOMAIYA
VIDYAVIHAR UNIVERSITY

08·06·2023(E)

Semester: January 2023 –May 2023 Maximum Marks: 100 Examination: ESE Examination – KT Duration:3 Hrs.		
Programme code: 04 Programme: B.Tech (IT)	Class: TY	Semester: V (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Information Technology	
Course Code: 116U04C502	Name of the Course: Operating 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)	What is an Operating System and its services?	5
ii)	Write basic commands of Linux (any five).	5
iii)	Write a note on Monolithic Kernel.	5
iv)	What are system calls? Explain the different categories of the system calls.	5
v)	Write a note on Real-time OS.	5
vi)	What is the purpose of command interpreter? Why is it usually separate from the Kernel?	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	Draw and explain 7 state process diagram.	5
ii)	Explain multithreading models with diagram. OR	5
Q2 A	Explain critical section and race condition with example.	10
Q 2 B	Solve any **One**	**10**
i)	Consider the set of 6 processes whose arrival time and burst time are given below	10

Process	Burst Time	Arrival Time
P0	11	1
P1	9	6
P2	7	7
P3	12	4
P4	14	3
P5	5	2

Calculate the average waiting time and average turnaround time for
a) Shortest remaining time first
b) Round Robin (Quantum Size =4)

ii)	What do you mean by PCB? Where is it used? What are its contents? Explain in detail.	10

<table>
<tr><th>Que. No.</th><th>Question</th><th>Max. Marks</th></tr>
<tr><td>Q3</td><td>Solve any Two</td><td>20</td></tr>
<tr><td>i)</td><td>A. What is Deadlock? And what are its necessary conditions?
B. Consider the following snapshot of a system:
<table>
<tr><th rowspan="2">Processes</th><th colspan="3">Allocation</th><th colspan="3">Max</th><th colspan="3">Available</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>P0</td><td>1</td><td>1</td><td>2</td><td>4</td><td>3</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>P1</td><td>2</td><td>1</td><td>2</td><td>3</td><td>2</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P2</td><td>4</td><td>0</td><td>1</td><td>9</td><td>0</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P3</td><td>0</td><td>2</td><td>0</td><td>7</td><td>5</td><td>3</td><td></td><td></td><td></td></tr>
<tr><td>P4</td><td>1</td><td>1</td><td>2</td><td>1</td><td>1</td><td>2</td><td></td><td></td><td></td></tr>
</table>
I. Calculate the need matrix?
II. Is the system in a safe state? Justify.
III. Determine the total amount of resources of each type (i.e. A, B, C)?</td><td>10</td></tr>
<tr><td>ii)</td><td>Demonstrate the complete process of Address Translation.</td><td>10</td></tr>
<tr><td>iii)</td><td>Explain Dining Philosopher problem and its solution.</td><td>10</td></tr>
</table>

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Explain concept of Paging in Memory Management of Operating System with example.	10
ii)	Consider the following page reference using four frames that are initially empty. Find the page faults using LRU and FIFO algorithm, where the page reference sequence: 7,0,1,2,03,0,4,2,3,0,3,2,3.	10
iii)	What is fragmentation? Explain the types of fragmentation. Propose the solution on fragmentation.	10

Que. No.	Question	Max. Marks
Q5	Solve any **Four**	**20**
i)	Write a note on Linux memory management.	5
ii)	Explain CLOOK disk scheduling algorithms with example.	5
iii)	Write a note on ReFS file system.	5
iv)	Explain SCAN disk scheduling algorithms with example.	5
v)	Write a note on ext-4 file system.	5
vi)	Write a note on Buddy Systems.	5

15.6.2023 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: August 2022 – December 2022 May 23		
Maximum Marks: 100 **Examination: ESE Examination** (KT)		**Duration:3 Hrs.**
Programme code: 01 **Programme: B Tech** Minor AIML	**Class: TY**	**Semester: V (SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department:**	
Course Code: 116m41L501	**Name of the Course: AI and ML** Artificial Intelligence	
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)	List the applications of AI.	5
ii)	Draw and explain the basic structure of an agent.	5
iii)	Define the terms Search Tree and Transition model with an example	5
iv)	What is meant by Inference System in knowledge based agents.	5
v)	What are Crypt Arithmetic Problems? Explain with an example	5
vi)	What are rational agents? Support your answer with an example	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	List any five important milestones in the history of Artificial Intelligence.	5
ii)	Distinguish between Deterministic v/s Stochastic with example.	5
	OR	
Q2 A	Suggest the most appropriate agent architecture to implement an AI agent to perform the given task. (1M) Justify why it would be the best.(1 M) Also explain the contents of every block in the architecture chosen. (8M) Mention assumptions/abstractions clearly. <u>Property broker agent</u> Assume an intelligent agent that would suggest diff properties for renting, buying and giving on lease, selling, i.e. for both sides of users. It might accept budget, location, no of people, purpose(workspace/home/personal/corporate) etc and display suggestions based on them.	10
Q 2 B	Solve any **One**	**10**
i)	Enumerate and explain any 5 properties of task environment.	10
ii)	Draw the Simple Reflex Agent and write the pseudo code for the same	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	Define Toy & Real World Problem. List the examples of Toy world and how it helps in solving AI Problems. Also state the disadvantages of Real World Problems	10
ii)	With respect to 4 Queen Problem, answer the following:- (i) Write the problem formulation along with transition model or state space tree for the same (7 M) (ii) Hence provide a solution to placing the 4 queens where no queen is attacking each other.(03M)	10
iii)	With respect to 8 puzzle problem ,answer the following :- (i) Write the problem formulation (3M) (ii) Solve and provide a solution (7M) START STATE GOAL STATE 8 3 5 1 2 3 4 1 6 8 * 4 2 7 * 7 6 5 * indicates blank tile	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Give and explain the generic knowledge based agent pseudo code with the help of TELL and ASK functions	10
ii)	Describe a typical Wumpus world problem in detail.	10
iii)	Draw the resolution graph for the following statements 1. Rahul likes all kinds of food. 2. Bread and Apple are food. 3. Rahul eats cashew and is still alive. 4. Anything eaten by anyone and is still alive is food. Goal: Rahul likes cashew.	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any **four**	**20**
i)	What is Supervised Learning? List types of it.	5
ii)	List the steps of NLP.	5
iii)	What are the components of Expert System?	5
iv)	Differentiate between Forward and Backward Chaining.	5
v)	Explain with an example what is meant alpha beta pruning	5
vi)	Write PEAS for Autonomous Mar Rover	5

15-6-2023 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Maximum Marks: 100	Semester: January 2023 – May 2023 Examination: ESE Examination – KT	Duration:3 Hrs.
Programme code: 04 Programme: Honours in AI	Class: TY	Semester: V(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the Department: IT	
Course Code: 116h66C501	Name of the Course: Machine Learning	
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 Machine Learning and Explain any one process involved in machine learning algorithm.	5
ii)	What is the difference between supervised and Unsupervised learning•give any five points(in tabular format)	5
iii)	You're running a company, and you want to develop learning algorithms to address the given problem. Problem: You have a large inventory of identical items. You want to predict how many of these items will sell over the next 3 months. Should you treat these as classification or as regression problem,explain?	5
iv)	Explain the problem of overfitting in machine learning.	5
v)	Write a short note on the estimating accuracy of a Classifier with hold out technique.	5
vi)	Explain interpolation problem in detail.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Explain McCulloch and Pitts Neurons and its limitation.	5
ii)	Explain the difference between SVM and K-means with features, advantages, disadvantages, application and diagram.	5
	OR	
Q2 A	Apply K-means Clustering algorithm to cluster the following eight points (with (x, y) representing locations) into three clusters: A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9)	10
Q 2 B	Solve any **One**	10
i)	Explain any one probabilistic discriminative model with : • Features • Advantages • Limitations • Algorithms • Application	10
ii)	Explain a) Minimizing Risk algorithm b) Hebb's rule	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	Explain Linear Regression Algorithm using method of least squares.	10
ii)	Write a short note on: 1. Probabilistic generative models 2. Linear Basis functions	10
iii)	What is clustering? Explain one application of clustering in detail.	10
Q4	Solve any **Two**	**20**
i)	Explain KNN algorithm in detail with pseudo code.	10
ii)		10

Classes	Yes	No	Total
Yes	90	210	300
No	140	9560	9700
Total	230	9770	10000

Calculate

- Sensitivity.
- Specificity,
- The classifier's overall accuracy
- The precision of the classifier for yes class
- Recall

iii)	Explain following terms in machine learning: 1. F1 score 2. Minimizing risk algorithm 3. Curse of dimensionality 4. Loss function	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any **four**	**20**
i)	Write a short note on radial basis function networks.	5
ii)	Write a short note on recursive least square estimation of the weight vector.	5
iii)	Write a short note on LDA.	5
iv)	Write a short note on Independent Component Analysis.	5
v)	Explain Cover's theorem on seperability of patterns.	5
vi)	What are different types of kernels in SVM, explain any two.	5

SOMAIYA VIDYAVIHAR UNIVERSITY 10.06.2023 (E)

Semester: January 2023 –May 2023 Maximum Marks: 100 Examination: ESE Examination – KT Duration:3 Hrs.		
Programme code: 04 Programme: B.Tech	Class: TY	Semester: V (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Information Technology	
Course Code: 116U04E514	Name of the Course: UI Programming	
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 the common problems with usability?	5
ii)	Are the human characteristics important in UI Programming?	5
iii)	Write a note on methods to collect business definitions.	5
iv)	Write a note on requirement analysis.	5
v)	Write a note on developing metaphors.	5
vi)	Write a note on screen distraction factors and types.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Explain the ordering of screen data and content.	5
ii)	Explain the screen navigation and flow.	5
	OR	
Q2 A	Define visually pleasing composition with any five qualities with example.	10
Q2 B	Solve any **One**	10
i)	Write a note on information architecture.	10
ii)	Explain organizational pattern and components.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	20
i)	Explain the patterns for page composition to design mobile UI.	10
ii)	Explain the patterns for labels and indicators to design mobile UI.	10
iii)	Explain the pattern for display of information.	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Explain the concept of patterns for confirmation.	10
ii)	Define patterns for drilldown to design mobile UI.	10
iii)	Write a note on patterns for lateral access to design mobile UI.	10

Que. No.	Question	Max. Marks
Q5	Write a note on following (Solve any **Four**)	**20**
i)	Signpost.	5
ii)	Wayfinding.	5
iii)	Environmental Clue.	5
iv)	Hover-Reveal Tools.	5
v)	Static Invitation.	5
vi)	Toggle-Reveal Tools.	5

13-6-2023 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: August 2022 – December 2022		
Maximum Marks: 100 **Examination: ESE Examination KT (MAY 23) Duration:3 Hrs.**		
Programme code: 04 (16) **Programme: B-Tech**	**Class: TY**	**Semester: V (SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department: IT**	
Course Code: 116U04C503	**Name of the Course: Information and Network Security (INS)**	
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)	List any 3 OSI Security Architecture Services & Mechanism. Explain any one Services & Mechanism in detail.	5
ii)	Explain Shannon`s Characteristics of Good Cipher	5
iii)	Use Play Fair Cipher to Encrypt & decrypt the following Plain Text "JINGLEBELLL" and Key as "SANTA".	5
iv)	Use Caesar's Cipher to decrypt the following "HQFUBSWHG WHAW" and find the actual Plain Text.	5
v)	What do you mean by CAPTCHA? List different type of CAPTCHA?	5
vi)	List out software security flaws. Explain any one in detail.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	What is the use of Secure Socket Layer (SSL) protocol? On which layer it works?	5
ii)	What is ARP spoofing? Explain it in terms of an attack on network.	5
	OR	
Q2 A	Answer the Following With respect to DDOS Attack (a)Explain how DDOS attack work on the system. (b)If you were a system administrator looking for whether your network is under DDOS attack, What would you look for and how would you prevent DDOS attack on the system?	10
Q 2 B	Solve any **One**	**10**
i)	Explain Diffie-Hellman Key Exchange Protocol to generate Symmetric Key with Diagram.	10
ii)	Encrypt the following Plain Text **"thegoldisintherefrigerator"** using Vignere Cipher with the keyword **"humor"** and give the final cipher text and Decrypt back to original Plain Text.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	Explain RSA Asymmetric key generation Algorithm in detail? Find the Private Key for following values of Public Key (e, n) = (7, 33) and Encrypt & Decrypt the Message m=2 ?	10
ii)	Explain how the new Key Stream is generated using RC4 Stream Cipher in detail with an Example?	10
iii)	Explain the working of A5/1 Stream Cipher algorithm in detail?	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Explain the CIA Model in detail & Explain its role in Cyber Crime.	10
ii)	Encrypt the Plain Text message "Hide the gold in the tree stump" using Row followed by Column Transposition taking Row key=2314 and Column key=213 and give the final Cipher Text.	10
iii)	Explain how password authentication method is useful for access control and State the Merit & Demerit of password authentication method.	10

Que. No.	Question	Max. Marks
Q5	Solve any **four**	**20**
i)	Write a Short Note on AES Algorithm with Diagram	5
ii)	Write a Short Note on DES Algorithm with Diagram	5
iii)	Explain Working of Needham–Schroeder Protocol with Diagram	5
iv)	Explain Working of Kerberos Protocol with Diagram	5
v)	Write a Short Note on Session Hijacking Attack	5
vi)	What is Honeypots and Explain why Honeypots are needed in Network Security?	5

15-6-2023 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: January 2023 –May 2023		
Maximum Marks: 100	**Examination: ESE Examination (KT)**	**Duration:3 Hrs.**
Programme code: 04 **Programme: BTech IT**	**Class: TY**	**Semester: V (SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department: IT**	
Course Code: 116m46C501	**Name of the Course: Database Management Systems-Minor**	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory **3) Assume suitable data wherever necessary**		

Que. No.	Question (Solve any four)	Max. Marks
~~Q1~~ i)	Draw diagram of three level DBMS architecture.	~~20~~ 05
i) ii)	Explain data independence in brief.	5
ii) iii)	What is need of data models? Explain any one data model in brief.	5
iii) iv)	List any five functions of database administrator.	5
iv) v)	What are the different types of database users?	5
v) vi)	Give any 5 disadvantages of file system.	5
vi) vii)	List all DML and DCL commands.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	What is weak entity set explain with example.	5
ii)	What are the ER diagram design issues?	5
	OR	
Q2 A	Explain following with example. 1. Primary key 2. Foreign key 3. Check constraint 4. Unique constraint 5. Alter table	10
Q 2 B	Solve any **One**	**10**
i)	UPS prides itself on having up-to-date information on the processing and current location of each shipped item. To do this, UPS relies on company-wide information system. Shipped items are the heart of the UPS product tracking information system. Shipped items can be characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date. Shipped items are received into the UPS system at a single retail center. Retail centers are characterized by their type, uniqueID, and address. Shipped items make their way to their destination via one or more standard UPS transportation events (i.e., flights, truck deliveries). These transportation events are characterized by a unique scheduleNumber, a type (e.g, flight, truck), and a deliveryRoute.	10

	Create an Entity Relationship diagram that captures this information about the UPS system. Be certain to indicate identifiers and cardinality constraints.	
ii)	Explain the steps of EER to Relational model conversion with example.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	Explain security and authorization in SQL.	10
ii)	What are triggers? Explain insert trigger syntax with example.	10
iii)	Explain SET theory operations in Relational Algebra.	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Explain conflict serializibility concept in detail.	10
ii)	Explain log based and checkpoint based recovery system in DBMS.	10
iii)	Explain the concept of shadow paging with diagram.	10

Que. No.	Question	Max. Marks
Q5	Write notes on any **four**	**20**
i)	Mobile database.	5
ii)	Parallel database applications.	5
iii)	Spatial database.	5
iv)	NoSQL database.	5
v)	Object relational database.	5
vi)	Temporal database.	5