University of Mumbai
### Examinations Summer 2022

Time: 2 hour 30 minutes   A.I.D.S   Sub - ADA   Max. Marks: 80

Q1. (20 Marks)	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	_____ is the class of decision problems that can be solved by non-deterministic polynomial algorithms.
Option A:	NP
Option B:	P
Option C:	Hard
Option D:	Complete
2.	Following data structure is used to implement LIFO Branch and Bound Strategy
Option A:	Priority Queue
Option B:	array
Option C:	stack
Option D:	Linked list
3.	For the given elements 6 4 11 17 2 24 14 using quick sort, what is the sequence after first phase, assuming the pivot as the first element?
Option A:	2 4 6 17 11 24 14
Option B:	2 4 6 11 17 14 24
Option C:	4 2 6 17 11 24 14
Option D:	2 4 6 11 17 24 14
4.	Which of the following is correct for branch and bound technique? i. It is BFS generation of problem states ii. It is DFS generation of problem states iii. It is D-search.
Option A:	Only i
Option B:	Only ii
Option C:	Only ii and iii
Option D:	Only i, and iii
5.	Consider the given graph.

	 What is the weight of the minimum spanning tree using the Kruskal's algorithm?
Option A:	24
Option B:	23
Option C:	15
Option D:	19
6.	Bellman Ford algorithm is used to find out single source shortest path for negative edge weights. Bellman Ford algorithm uses which of the following strategy?
Option A:	Greedy method
Option B:	Dynamic Programming
Option C:	Backtracking
Option D:	Divide and Conquer
7.	The optimal solution for 4-queen problem is
Option A:	(2,3,1,4)
Option B:	(1,3,2,4)
Option C:	(3,1,2,4)
Option D:	(2,4,1,3)

8.	Consider the following code snippet:
	
	Bounding function(k,i) {
	
	for(j=1 to k-1)
	
	  { if ((x[j]==i) or (Abs(x[j]-i) ==abs(j-k))) return false;
	
	  } return true }
	
	The above code represents the bounding function for which of the following algorithm?

Option A:	Subset sum problem using backtracking
Option B:	n-queens using backtracking
Option C:	Graph coloring using backtracking
Option D:	Subset sum using branch and bound
9.	What do you mean by chromatic number?
Option A:	The minimum number of colors needed to color all the vertices optimally in a Graph

	Coloring problem
Option B:	The maximum number of colors needed to color all the vertices optimally in a Graph Coloring problem
Option C:	The number of colors using which the edges of graph have been colored in a Graph Coloring Problem
Option D:	The individual colors with which we color the vertices of a Graph in a Graph Coloring Problem
10.	Which string matching algorithm uses a Prefix Table?
Option A:	Naïve String Matching Algorithm
Option B:	Boyer Moore String Matching Algorithm
Option C:	Knuth Morris Pratt Algorithm
Option D:	Rabin Karp Algorithm

Q2. (20 Marks)	Solve any Four out of Six 05 marks each
A	Write and Explain binary search algorithm.
B	Write a short note on job sequencing with deadline
C	Determine the LCS of the following sequences: X: {A, B, C, B, D, A, B} Y: {B, D, C, A, B, A}
D	Solve the sum of subsets problem for the following: n=4, m=15, w={3,5,6,7}
E	Give the algorithm for the N-Queen's problem and give any two solutions to the 8-Queen's problem
F	Explain and apply Naïve string matching on following strings String1: COMPANION String2: PANI

Q3. (20 Marks)	Solve any Two Questions out of Three 10 marks each
A	Write algorithm for greedy knapsack and Obtain the solution to following knapsack problem where n=7,m=15 (p1,p2.....p7) = (10,5,15,7,6,18,3), (w1,w2,.....,w7) = (2,3, 5,7,1,4,1).
B	Explain Dijkstra's Single source shortest path algorithm. Explain how it is different from Bellman Ford algorithm. Explain 15-puzzle problem using LC search technique.
C	Rewrite and Compare Rabin Karp and Knuth Morris Pratt Algorithms Give the pseudo code for the KMP String Matching Algorithm.

Q4. (20 Marks)	Solve any Two Questions out of Three 10 marks each
A	Write algorithm for quick sort and sort the following elements [40,11,4,72,17,2,49]
B	Write multistage graph algorithm and solve following example.
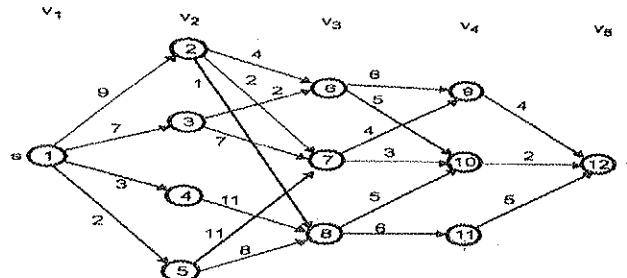
Write algorithm for 0/1 knapsack problem using dynamic programming .Also solve the following example.

N=4, M=21 (p1,p2,p3,p4)=(2,5,8,1),(w1,w2,w3,w4)=(10,15,6,9)

University of Mumbai
Examination First Half 2022 under cluster __ (Lead College: _____)
Examinations Commencing from 16 MAY 2022 to 30 MAY 2022
Program: __BE COMPUTER ENGINEERING_____
Curriculum Scheme: Rev2019 (C scheme)
Examination: SE   Semester : IV
Course Code: _CSC 401____ and Course Name: ___Engineering Mathematics IV
Time: 2 hour 30 minutes   Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	If X is a Poisson variate and $P(X=1)=P(X=2)$,then $E(X^2)$ is
Option A:	1
Option B:	5
Option C:	8
Option D:	6
2.	If $A = \begin{bmatrix} 2 & 0 & -1 \\ 0 & 2 & 0 \\ -1 & 0 & 2 \end{bmatrix}$ Eigen value of Adj. A are
Option A:	5,6,2
Option B:	2,3,6
Option C:	5,3,6
Option D:	1,3,6
3.	If $f(z) = \frac{3z^2+z}{z^2-1}$, then residue of f(z) at z= -1 is
Option A:	1
Option B:	-1
Option C:	2
Option D:	-2
4.	The value of $\int_C \frac{\cos \pi z}{z^2-1} dz$ where C is the circle $|z| = 1/2$
Option A:	πi
Option B:	$2 \pi i$
Option C:	0
Option D:	$- \pi i$
5.	According to Time shifting property of z-transform, if X(z) is the z-transform of x(n) then what is the z-transform of x(n-k)?
Option A:	$z^{-k}X(z)$
Option B:	$z^k X(z)$
Option C:	X(z+k)
Option D:	X(z-k)
6.	The value of $Z^{-1} \left[\frac{z^2}{(z-a)(z-b)} \right]$ is
Option A:	$\dfrac{a^{n+1} - b^{n+1}}{a+b}$

Option B:	$$\frac{a^{n+1} + b^{n+1}}{a - b}$$
Option C:	$$\frac{a^{n+1} - b^{n+1}}{a - b}$$
Option D:	$$\frac{a^{n+1} + b^{n+1}}{a + b}$$

7.	If a random variable X follows Poisson distribution such that P(X=0)=6P(X=3), find the mean and variance of the distribution.
Option A:	$mean = 1, variance = 1$
Option B:	$mean = 1, variance = -1$
Option C:	$mean = 1, variance = 2$
Option D:	$mean = 1, variance = -2$

8.	In normal distribution
Option A:	Mean = Median = Mode
Option B:	Mean < Median < Mode
Option C:	Mean> Median > Mode
Option D:	Mean ≠ Median ≠ Mode

9.	If the primal LPP has an unbounded solution then the dual has
Option A:	Unbounded solution
Option B:	Bounded solution
Option C:	Feasible solution
Option D:	Infeasible solution

10.	The value of Lagrange's multiplier λ for the following NLPP is Optimize $z = 6x_1^2 + 5x_2^2$ Subject to $x_1 + 5x_2 = 7$ $x_1, x_2 \geq 0$
Option A:	$\lambda = 31/84$
Option B:	$\lambda = 84/31$
Option C:	$\lambda = 13/74$
Option D:	$\lambda = 31/64$

Q2	Solve any Four out of Six	5 marks each
A	Given $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$, find the eigenvalues of A. Also find eigenvalues of $4A^{-1}$ and eigenvector of $A^2 - 4I$.	
B	Evaluate $\int_0^{1+i}(x^2 - iy)dz$ along the path (i) $x^2 = y$ (ii) y = x	
C	Find $Z\{2^k \cos(3k + 2)\}, k \geq 0.$	
D	The following table gives the number of accidents in a city during a week. Find whether the accidents are uniformly distributed over a week	

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total

	No. of accidents	13	15	9	11	12	10	14	84

E	Solve by Simplex Method $Maximise \quad z = 7x_1 + 5x_2$ Subject to $\quad -x_1 - 2x_2 \geq -6$ $\qquad\qquad 4x_1 + 3x_2 \leq 12$ $\qquad\qquad x_1, x_2 \geq 0$
F	Solve the following NLPP $Maximise \quad z = -2x_1^2 - x_2^2 + 10x_1 + 4x_2$ Subject to $\quad 2x_1 + x_2 \leq 5$ $\qquad\qquad\qquad x_1, x_2 \geq 0$

Q3	Solve any Four out of Six	5 marks each
A	Find the Eigen values and Eigen Vectors of the following matrix. $$A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 3 & -1 \\ 1 & -1 & 3 \end{bmatrix}$$	
B	Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ where C is the circle $|z| = 3$	
C	Obtain inverse z-transform $\frac{z+2}{z^2 - 2z - 3}$, $1 < |z| < 3$	
D	The height of six randomly chosen sailors are in inches: 63,65,68,69,71,72. The height of 10 randomly chosen soldiers are: 61,62,65,66,69,69,70,71,72 and 73.	
E	Solve by the dual Simplex Method $Minimise \ z = 6x_1 + 3x_2 + 4x_3$ Subject to $\quad x_1 + 6x_2 + x_3 = 10$ $\qquad\qquad 2x_1 + 3x_2 + x_3 = 15$ $\qquad\qquad x_1, x_2 \geq 0$	
F	Find the relative maximum or minimum of the function $z = x_1^2 + x_2^2 + x_3^2 - 8x_1 - 10x_2 - 12x_3 + 100$	

Q4	Solve any Four out of Six	5 marks each
A	Show that the following matrix is diagonalizable. Also find the diagonal form and a diagonalizing matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$	
B	Evaluate $\int_C \frac{4z^2 + 1}{(2z-3)(z+1)^2} dz$, $C: |z| = 4$ using Cauchy's residue theorem.	
C	Find the inverse z-transforms of $F(z) = \frac{z}{(z-1)(z-2)}$, $|z| > 2$	

D	If the heights of 500 students is normally distributed with mean 68 inches and standard deviation 4 inches, estimate the number of students having heights (i) greater than 72 inches (ii) less than 62 inches (iii) between 65 and 71 inches.
E	Using Simplex method Maximize $z = 10x_1 + 6x_2 + 5x_3$ Subject to $\quad 2x_1 + 2x_2 + 6x_3 \leq 300$ $\qquad\qquad 10x_1 + 4x_2 + 5x_3 \leq 600$ $\qquad\qquad x_1 + x_2 + x_3 \leq 100$ $\qquad\qquad\qquad x_1, x_2, x_3 \geq 0$
F	Using Lagrange's multiplier optimize $z = 4\,x_1 + 6x_2 - 2\,{x_1}^2 - 2\,x_1 x_2 - 2{x_2}^2$ subject to $x_1 + 2x_2 = 2$ $\qquad\qquad\qquad x_1,\ x_2 \geq 0$

A.I.D.S

SE Sem-IV (COMP/AIDS/CYSE) MP

University of Mumbai

Examination Summer 2022

QP: 93977

Time: 2 hour 30 minutes   Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	8086 supports _____ software Interrupts
Option A:	2
Option B:	64K
Option C:	256
Option D:	8
2.	In 8086 size of pre fetch queue is
Option A:	6 Byte
Option B:	4 Byte
Option C:	4 Bit
Option D:	2 Byte
3.	The instruction that unconditionally transfers the control of execution to the specified address is
Option A:	JMP
Option B:	IRET
Option C:	RET
Option D:	CALL
4.	In PUSH instruction, after each execution of the instruction, the stack pointer is
Option A:	incremented by 1
Option B:	decremented by 1
Option C:	incremented by 2
Option D:	decremented by 2
5.	_____ stores the bits required to mask the IR lines of 8259
Option A:	ISR
Option B:	IMR
Option C:	IRR
Option D:	PR

Option D:	CR0, CR1 CR2,CR3
8.	How many flags are active in flag register of 80386?
Option A:	9
Option B:	12
Option C:	13
Option D:	10
9.	What lead to the development of MESI and MEI protocol ?
Option A:	Cache size
Option B:	Cache Coherency
Option C:	Bus snooping
Option D:	Number of caches
10.	Hyperthreading uses the concept of
Option A:	Simultaneous multithreading
Option B:	Distributed decoding
Option C:	Multiple switching
Option D:	Pipelining

Q2	Solve any Two Questions out of Three 10 marks each
A	Explain and draw IVT? Differentiate between hardware and software interrupts?
B	Explain descriptors and paging mechanism in protected mode of 80386 ?
C	Explain the Initialization command words (ICWs) and Operational command words(OCWs) of the 8259 PIC.

Q3	Solve any Two Questions out of Three 10 marks each
A	Write an 8086 assembly language program to print the flag registers
B	Design 8086 microprocessor based system working in minimum mode with the following specifications. I) 8086 microprocessor working at 8 MHz. II) 16 KB EPROM using 8K devices. Clearly show memory map with address range. Draw a neat schematic.
C	Explain protection mechanism of 80386 with diagram.

Q4	Solve any Two Questions out of Three	10 marks each
A	Draw and explain timing diagram of memory read and memory write operation in minimum mode.	
B	Explain Pentium 4 Net burst micro architecture and write a note on hyperthreading	
C	Explain Integer and Floating-Point Pipeline of Pentium.	

AIDS

Program: **Computer Engineering**

Curriculum Scheme: CBGS / R-19 (C-scheme)

Program No. : 1T00734

Name of the Examination: SE Sem - IV

Subject paper Code: 40524

Course Name: Operating System

QP code — 93542

Time: 3 hours   Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	When a computational speed and resource sharing is required and implemented through various full computer systems in a network, what OS should be chosen?
Option A:	Real-time OS
Option B:	Distributed OS
Option C:	Embedded OS
Option D:	Batch OS
2.	Core of operating system is _____
Option A:	Shell
Option B:	Kernel
Option C:	Commands
Option D:	Script
3.	Which of the following state transitions is not possible?
Option A:	Blocked to running
Option B:	Ready to running
Option C:	Running to blocked
Option D:	Blocked to ready
4.	Degree of multiprogramming is characteristic of
Option A:	Long Term Scheduler
Option B:	Short Term Scheduler
Option C:	Medium Term Scheduler
Option D:	Dispatcher
5.	The situation where more than one processes access and update the same data concurrently and the result depends on the sequence of execution in which it takes place is known as
Option A:	Critical section

Option B:	Deadlock
Option C:	Non-critical section
Option D:	Race condition
6.	Which algorithm requires that the system must have some additional *a priori* information available about resources?
Option A:	Deadlock prevention
Option B:	Deadlock recovery
Option C:	Deadlock avoidance
Option D:	Deadlock allocation
7.	Which Page replacement algorithm suffers from Belady's Anomaly?
Option A:	LRU
Option B:	FIFO
Option C:	Optimal
Option D:	None of the Above
8.	Which technique is used to overcome external fragmentation when Dynamic Partitioning is used during the process to memory allocation?
Option A:	Polling
Option B:	Page fault
Option C:	Context switch
Option D:	Compaction
9.	Which one is not a file attributes?
Option A:	Time, date, and user identification
Option B:	Name
Option C:	Truncate
Option D:	Protection or Permission
10.	In _____ algorithm, the disk head moves from one end to the other , servicing requests along the way, when the head reaches the other end, it immediately returns to the beginning of the disk without servicing any requests on the return trip.
Option A:	LOOK
Option B:	C-LOOK
Option C:	C-SCAN
Option D:	SCAN

Q2.	**Solve any Four out of Six**	**5 marks each**
A	Describe microkernel operating system structure.	
B	What is the need of thread? Describe any four advantages of multithreading model.	
C	How to solve busy waiting problem?	

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D	What is the producer consumer problem? Provide solution to producer consumer problem using semaphores.
E	Give details of file organization types
F	Give details of IO Buffering techniques.

Q3.	Solve any Two Questions out of Three		10 marks each
A	Consider the following set of processes.		

Process	Burst Time	Arrival Time	Priority
P1	0	4	2(L)
P2	1	2	4
P3	2	3	6
P4	3	5	10
P5	4	1	8
P6	5	4	12 (H)
P7	6	6	9

Note Higher number is having higher priority.

1. Draw Gantt chart for SJF-Preemptive Scheduling and Preemptive Priority scheduling.
2. Calculate average waiting time, average turnaround time and average response time for this scheduling algorithms.

B	Define Deadlock. Explain the necessary & sufficient conditions of deadlock. Suggest techniques to avoid deadlock.
C	Given five memory partition of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order), how would the first-fit, best-fit and worst-fit algorithms place processes of P1-212 KB, P2-417 KB, P3-112 KB and P4-426 KB (in order)? Which algorithm makes the most efficient use of memory? Use fixed size Dynamic partitioning method.

Q4.		
A	Solve any Two	5 marks each
i.	Draw and Explain five state process model.	
ii.	Explain with the help of a diagram how the system call will be generated?	
iii.	Explain the effect of page size on performance.	
B	Solve any One	10 marks each
i.	Describe Disk Scheduling algorithms with example	
ii.	Explain File Allocation methods in detail.	

A.I.D.S.

University of Mumbai
Examinations Summer 2022
S.E. (Computer Engineering) (SEM-IV)
(Choice Base Credit Grading System) (R- 19) (C Scheme)
Subject: Database Management System

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The capacity to alter the database schema at one level without affecting any other levels is termed as
Option A:	Data Independence
Option B:	Data Mapping
Option C:	Data Isolation
Option D:	Data Transformation
2.	An attribute (say A) of entity set is calculated from other attribute value (say B). The attribute A is called
Option A:	Single valued
Option B:	Multi valued
Option C:	Composite
Option D:	Derived
3.	Consider the following relations: Parts (pid,pname,color) PartCost (pid,cost) What does the following relational algebra expression represent? $\Pi_{pid}((\sigma_{color='red'}(Parts)) \bowtie (\sigma_{cost\geq1000}(PartCost)))$
Option A:	Find the pid of all parts whose color is red.
Option B:	Find the pid of all parts whose color is red or cost ≥ 1000.
Option C:	Find the pid of all parts whose color is red but not cost ≥ 1000.
Option D:	Find the pid of all parts whose color is red and cost ≥ 1000 .
4.	Let E1 and E2 be two entities in an E-R diagram with one multi-valued attribute in E1, R1 and R2 are two relationships between E1 and E2, where R1 is one-to-many and R2 is many-to-many, R1 and R2 do not have any attributes of their own, What is the minimum number of tables required to represent this situation in the relational model.
Option A:	2
Option B:	4
Option C:	3
Option D:	5
5.	Consider the instructor table: INSTRUCTOR (instr_id, name, dept name, salary). insert a new instructor `I-101', named `PMJ', with 50,000 salary for department `COMP'. Identify the appropriate SQL statement.
Option A:	INSERT INTO TABLE INSTRUCTOR VALUES ('I-101','PMJ','COMP', 10,00,000)
Option B:	INSERT INTO INSTRUCTOR ('I-101','PMJ','COMP', 50,000)
Option C:	INSERT INTO INSTRUCTOR VALUES ('I-101', `PMJ', 'COMP', 50,000)

Option D:	INSERT INTO TABLE INSTRUCTOR table instr_id, name, dept name, salary) VALUES ('I-101', 'PMJ', 'COMP', 50,000)
6.	Let R= (A, B, C, D, E, F) be a relation with the following dependencies. B->CE ,C->F, EC->D, A->B. Which of the following is a candidate key for R
Option A:	C
Option B:	E
Option C:	A
Option D:	B
7.	Identify the incorrect statement.
Option A:	3NF doesn't have transitive dependencies
Option B:	Composite attributes are not allowed in 1NF
Option C:	In 2NF, there should not be any Full functional dependencies
Option D:	In BCNF, trivial FD are allowed
8.	If T1,T2 are two transactions and I1 , I2 are two instructions of T1 and T2 respectively then I1 and I2 are conflicting instructions if
Option A:	They operate on the different data item
Option B:	They belong to different transactions
Option C:	At Least one of them is a write operation
Option D:	At Least one of them is a read operation
9.	Choose the correct option
Option A:	Every Conflict serializable schedule is also View serializable
Option B:	Every View serializable schedule is also conflict serializable
Option C:	Both a and b
Option D:	Every serial schedule has same conflict and view equivalent schedule
10.	When a transaction is aborted due to ant kind of failure,which instruction should be executed to keep database in consistent state
Option A:	Commit
Option B:	Rollback
Option C:	Savepoint
Option D:	Checkpoint

Q2	Solve any Two Questions out of Three 10 marks each
A	Short note on Data Independence. Define DBA Discuss roll and responsibilities of DBA.
B	Convert following E-R diagram to relational schema and equivalent schema diagram
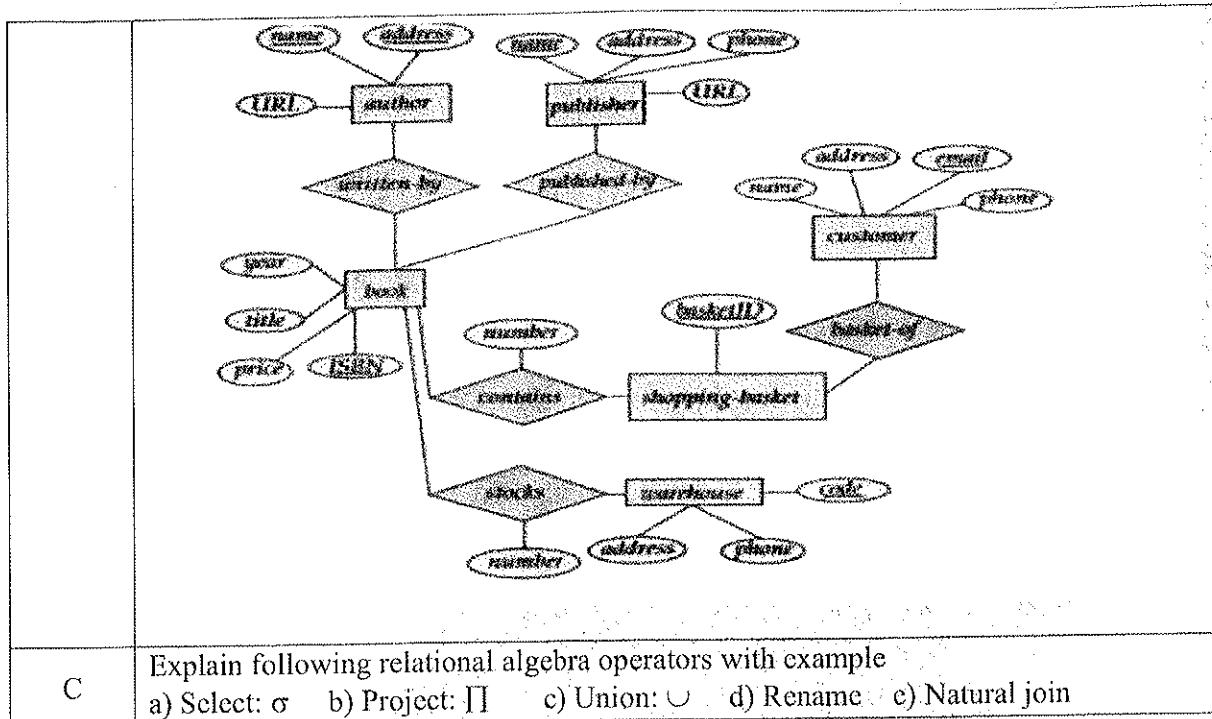
C	Explain following relational algebra operators with example a) Select: σ b) Project: ∏ c) Union: ∪ d) Rename e) Natural join

Q3	**Solve any Two Questions out of Three 10 marks each**
A	Book (book_id, title, author, cost) Store (store_no, city, state, inventory_val) Stock (store_no, book_id, quantity) Consider above relational schema and formulate SQL queries for the following: (i)Modify the cost of DBMS books by 10% (ii)Find the author of the books which are available in Mumbai store (iii)Find the title of the most expensive book (iv)Find the total quantity of books in each store (v) Add a new record in Book (Assume values as per requirement)
B	Why there is need of normalization? Explain 1NF,2NF,3NF and BCNF with examples.
C	Design an EER schema for a **BANK** database. Each bank can have multiple branches, and each branch can have multiple accounts and loans. Bank keeps the track of different types of Accounts (Saving_aacount, Checking_account), Loans (Car_loans,Home_loans,...) , each account's Transaction (deposit, withdrawal,check,..) and each loan's Payments; both of these include the amount, date and time. State any assumptions you make about the additional requirement clearly.

Q4	**Solve any Two Questions out of Three 10 marks each**
A	What is Deadlock and explain deadlock handling in DBMS with Example.

	A schedule has transactions T1, T2, T3 has given below:		
	T1	**T2**	**T3**
	READ(X)		
		READ(Z)	
	READ(Z)		
			READ(X)
			READ(Y)
	WRITE(X)		
			WRITE(Y)
B		READ(Y)	
		WRITE(Z)	
		WRITE(Y)	

    a) What is conflict and view serializability?

    b) Draw a Precedence graph?

    c) Is schedule conflict serializable or not?

    d) Find equivalent serial schedule?

C	Describe ACID properties with examples and draw state transition diagram of transaction.