qp code : 10082319

SE. sem IV CSE (IOT) R-19 C scheme

Duration: 3hrs **[Max Marks:80]**

Q.1 (a) Design 8086 microprocessor-based on following Specifications: 10
1. MP 8086 working at 8MHz minimum mode.
2. 64 KB EPROM using 32 KB Devices
3. 64 KB SRAM using 16KB device

(b) Explain Addressing modes of 8086 microprocessor. Explain Programming Model of 8086. 10

Q.2 (a) Explain the Initialization command words (ICWs) and Operational command words(OCWs) of the 8259 PIC. 10

(b) Explain the interrupt structure of the 8086 processor(IVT) and differentiate between Hardware and Software interrupts 10

Q.3 (a) Comparison 80386 ,Pentium 1 ,Pentium 2 and Pentium 3 Processor 10

(b) Write an assembly language program for searching a Character in a Given String.(Consider your own String) and Explain the following instructions: LODSB, NOP,,RCR,CLR related to 8086. 10

Q.4 (a) List the features of Pentium 4 processor. Explain Net burst microarchitecture. 10

(b) Explain MESI Protocol 10

Q.5 (a) Draw and explain architecture of 8086. 10

(b) Differentiate between real Mode , Virtual Mode and Protected Mode of 80386 Processor .Explain the Floating point Pipeline of Pentium Processor 10

Q.6 (a) Explain Modes of 8259. 10

(b) Write an ALP for 8086 to transfer the block of data. 10

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 QP code : 10079705

SE sem IV CSE(IOT) R-19 C scheme

Duration: 3hrs **[Max Marks:80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

Q. 1 Attempt any FOUR [20]

a Explain the types of Multiprocessor Systems [5]

b Differentiate between context switching and interrupt handling [5]

c A counting semaphore S is initialized to 10. Then, 6 P operations and 4 V operations are performed on S. What is the final value of S? [5]

d Calculate the effective memory access time in nanoseconds if the hit ratio to a TLB is 80%, and it takes 15 nanoseconds to search the TLB, and 150 nanoseconds to access the main memory. [5]

e What is file? Explain File attributes [5]

Q. 2 a Explain Producer Consumer Problem with solution using Semaphore [10]

b Explain one system call of each type of system calls with an example [10]

Q. 3 a Draw a Gantt Chart and Calculate average waiting time and average turnaround time for FCFS, Pre-emptive Priority, SJF Pre-emptive and Round Robin algorithm (Time Quantum=2) for the following set of processes with arrival time (in milliseconds) and CPU burst time (in milliseconds). [10]

Process	Arrival Time	Burst Time	Priority
P1	3	2	1
P2	1	1	2
P3	3	3	0
P4	4	5	3
P5	5	4	4

b Consider the following snapshot of a system. [10]

Processes	Allocation		
	A	B	C
P0	0	1	0
P1	2	0	0
P2	3	0	3
P3	2	1	1
P4	0	0	2

Request		
A	B	C
0	0	0
2	0	2
0	0	0
1	0	0
0	0	2

Available		
A	B	C
0	0	0

Answer the following questions using the Deadlock Detection algorithm:

i. Check if the system is in a safe state? If Yes find out safe sequence state 5

ii. If a request from process P2 arrives for (0,0,1), can the request be granted immediately? 3

iii. Determine the total instances of each type of resource. 2

Q. 4 a Explain Belady's Anomaly with an example and how to solve it. [10]
Calculate Hit Ratio and Miss Ratio for the page replacement policy of LRU's Counter implementation method and LRU's Stack implementation method for given reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. Assuming three frame size for counter method and Five frame size for Stack method.

b Explain Disk scheduling criteria with example [10]

Q. 5 a Explain steps for handling page fault in virtual memory. [10]

b Explain the Five state process model with two suspended state [10]

Q. 6 Write short notes on Following [20]

a Multithreading Models [5]
b Resource Allocation Graph [5]
c File Allocation Methods [5]
d Virtual Memory Paging Vs Virtual Memory Segmentation [5]

QP code : 10085389

Paper / Subject Code: 38983 / Database Management System

SE sem IV CSE(IOT) R-19 C scheme

Duration: 3 Hours **[Max Marks:80]**

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 **Solve any two out of three questions.** **[20]**

A What is DDL and DML commands. Write syntax and examples for DDL and DML commands. **[10]**

B Discuss with suitable example Extended E-R features Specialization, Generalization and aggregation. **[10]**

C Explain any five relational algebra operators with suitable example. **[10]**

2 A Explain different types of users for database system and explain responsibilities of DBA. **[10]**

B What is Normalization. Explain 1 NF,2 NF,3NF with suitable example. **[10]**

3 A i) Explain ACID properties of transaction. **[10]**
ii) In a Hospital Management System there are many departments and many patients. Doctors work in various departments and treat multiple patients. Patients undergo multiple tests, and each test is conducted by lab technicians under a specific department.
Consider the above scenario and draw an E-R diagram. (Represent proper cardinalities)

B Explain types of joins with suitable example. **[10]**

4 A Define trigger. Explain syntax of trigger with suitable example. **[10]**

B Discuss 2PL with its types **[10]**

5 A I) Write the SQL expression for the following. **[10]**
customer(cust_id, cname, caddress, ph_no, balance)
i) Find the names of customers whose name starts with the letter 'A'.
ii) Add one record with the values (105, 'Rakhi', 'Malad', 9826756045, 3400).
iii) Remove the data of the customer whose name is 'Abhay' and phone number is 8890654312.
iv) Find the total number of customers.
II) Define view. Write syntax of creation of view considering suitable example.

B Explain conflict serializability with suitable example. **[10]**

6 A Write a note on Time stamp ordering protocol. **[10]**

B Explain deadlock handling. **[10]**

SE Sem IV R-19 C scheme CSE(IOT)

QP code: 10081974

(03 HOURS) (MAX. MARKS : 80)

13 MAY 2025

Note:

1. Question **No. 1** is compulsory.
2. Attempt **any three** questions out of remaining **five** questions.
3. Assume suitable data wherever necessary.
4. Figures to right indicate full marks.

Q.1 Answer the following **(Any four)** **Marks**

a. If $A=\begin{bmatrix}2 & 2 & 1\\ 1 & 3 & 1\\ 1 & 2 & 2\end{bmatrix}$ Find the characteristic roots of A^3+I. **05**

b. Evaluate $\int f(z)\,dz$ along the parabola $y=2x^2$ from $z=0$ to $z=3+18i$ Where $f(z)=x^2-2iy$. **05**

c. Determine all basic solutions and optimal basic feasible solution to the following problem. Max. $z=x_1+3x_2+3x_3$ **05**

Subject to $x_1+2x_2+3x_3=4$,

$2x_1+3x_2+5x_3=7$,

$x_1, x_2, x_3 \geq 0$.

d. Find the z-transform of $f(k)=3^k$, $k\geq 0$. **05**

Q.2 a. Find the Eigenvalues and Eigenvectors of the matrix $A=\begin{bmatrix}6 & -2 & 2\\ -2 & 3 & -1\\ 2 & -1 & 3\end{bmatrix}$. **06**

b. The heights of six randomly chosen sailors are in inches: 63, 65, 68, 69, 71 and 72. The heights of ten randomly chosen soldiers are: 61, 62, 65, 66, 69, 69, 70, 71, 72, and 73. discuss in the light that these data throw on the suggestion that the soldiers on an average are taller than sailors. **06**

c. Use the dual simplex method to solve the L.P.P. **08**

Maximize $z = -3x_1 - 2x_2$

Subject to $x_1 + x_2 \geq 1$;

$x_1 + x_2 \leq 7$;

$x_1 + 2x_2 \geq 10$;

$0x_1 + x_2 \leq 3$;

$x_1, x_2 \geq 0$

Q.3 a. Find the relative maximum or minimum of the function $Z=x_1^2+x_2^2+x_3^2-8x_1-10x_2-12x_3+100$.. **06**

b. If $f(k)=4^k U(K)$ and $g(k)=5^k U(k)$, then find the Z-transform of $\{f(k)*g(k)\}$. **06**

c. Find all possible Laurents expansion of $f(z)=\frac{z}{(z-1)(z-2)}$ about $z=-2$. **08**

Q.4 a. Verify Cayley-Hamilton theorem for the matrix A and hence find the matrix represented by **06**

by $A^6 - 6A^5 + 9A^4 + 4A^3 - 12A^2 + 2A - I$ where $A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$.

b. In a survey of 200 boys of which 75 were intelligent ,40 had educated fathers, while 90 of the unintelligent boys had uneducated fathers. Do these figures support the hypothesis that educated fathers have intelligent boys. **06**

c. Using the Kuhn –Tucker conditions to solve the N.L.P.P **08**

Maximize $z = 8x_1 + 10x_2 - x_1^2 - x_2^2$

Subject to $3x_1 + 2x_2 \leq 6;$

$x_1, x_2 \geq 0$

Q.5 a. Evaluate $\oint \frac{3z^2+z}{z^2-1}\, dz$ using Cauchy's residue theorem, **06**

where C is the circle $|z| = 2$.

b. Using the method of Lagrange's multiplier solve the N.L.P. **06**

Optimize $z = 10x_1 + 8x_2 + 6x_3 + 2x_1^2 + x_2^2 + 3x_3^2 - 100.$

Subject to $x_1 + x_2 + x_3 = 20.$

$x_1, x_2, x_3 \geq 0.$

c. The marks obtained by 1000 students in an examination are found to be normally **08**
Distributed with mean 70 and s. d. 5. Estimate the number of students whose marks Will be (i) between 60 and 75 (ii) more than 75.

Q.6 a. Find the inverse z- transform of $F(z) = \frac{1}{(z-3)(z-2)}$ if ROC is $2 < |z| < 3$. **06**

b. Show that the matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalisable. find the diagonal form D and diagonalizing matrix M. **06**

c. Solve the L.P.P by simplex method. **08**

Maximize $z = 4x_1 + 3x_2 + 6x_3$

Subject to $2x_1 + 3x_2 + 2x_3 \leq 440;$

$4x_1 + 0x_2 + 3x_3 \leq 470;$

$2x_1 + 5x_2 + 0x_3 \leq 430;$

$x_1, x_2, x_3, \geq 0.$

SE - IV - IOTCSBCT - R-19 QP :- 20000394

(Time: 3 Hours) (Maximum Marks: 80)

NB. 1. Question number one is compulsory
2. Attempt any three out of remaining five questions
3. Assume suitable data
4. Figures to the right indicate the maximum marks

Q1 **Attempt any FOUR (Each question carries 5 Marks).** **(20)**

a) Apply and show the use of all the relevant terminology of Relational Model with example.

b) Explain different aggregate functions.

c) Explain having clause and Group by clause with suitable example.

d) List and discuss primary functions of a Database Administrator (DBA)?

e) Explain Log based recovery.

Q2 a) Explain overall architecture of DBMS in detail with appropriate diagram. **(10)**

b) Explain Functional dependency with example. **(10)**

Q3 a) Construct EER diagram for university management system. **(10)**

b) Discuss concept of keys in detail with suitable example. **(10)**

Q4 a) Write SQL queries for given database. **(10)**

CUSTOMER(cid, cname, age, city, account_type, balance)
EMPLOYEE(eid, ename, designation, salary)
TRANSACTION(tid, cid, eid, trans_date, amount, trans_type)

1] Write an SQL query to List the names of all customers who have a 'Savings' account..

2] Find the names and designations of employees who earn more than ₹80,000.

3] Write an SQL query to count the number of transactions handled by each employee.

4] List the names of all customers in descending order of their balance.

5] List the names of all customers whose names start with 'A '.

b) Explain different types of Join with example. **(10)**

Q5 a) Define Normalization and Explain 1NF, 2NF, 3NF and BCNF with examples. **(10)**

b) Explain Problems with concurrent execution. **(10)**

Q6 a) Describe ACID properties of transaction with example. **(10)**

b) Explain Trigger syntax with suitable example. **(10)**

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SE - IV - IoT - R - 19 qp: 1009655

Duration: 3hrs **[Max Marks:80]**

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any **FOUR** [20]

a Explain the different types of directory structures used in operating systems with examples.

b What is a Process Control Block (PCB)? What information does it contain?

c Explain how the frame size in memory management affects the overall performance of the operating system.

d What is mutual exclusion ?Give its significance

e What is a system call? Explain any two types of system calls with examples

2 a Explain file allocation methods in detail [10]

b What is Multithreading? Give its advantages and disadvantages. [10]

3 a Consider the page reference string :-2,3,4,2,1,3,7,5,4,3,2,3,1 with frame size3. Calculate page hit and page miss for LRU, FIFO and Optimal page replacement algorithm. [10]

b What is the role of semaphore in process synchronization? How do counting semaphores and binary semaphores differ? [10]

4 a Explain Translation Lookaside Buffer (TLB) of memory management in detail. [10]

b Differentiate between monolithic,microkernel and layered structure of operating system [10]

5 a Explain the different methods of recovering a system from deadlock with suitable examples. [10]

b Consider the following set of processes, assuming all are arrived at time 0. Calculate average waiting time and turnaround time for FCFS, SJF, Priority and RR(Q=2) [10]

Process	Burst time	Priority
P1	2	2
P2	1	1
P3	8	4
P4	4	5
P5	5	3

6 a Discuss various disk scheduling algorithms with examples. [10]

b Explain different types of memory fragmentations with example [10]

SE - IV - IOT - R-19

QP: 10095034

[Max Marks:80]

Duration: 3hrs

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any FOUR [20]

a Explain the following instructions: STOSB, DAA related to 8086.

b Discuss in brief the protection mechanism of 80386DX

c Explain the maximum mode of 8086

d Explain in brief cache organization of Pentium processor

e Write an assembly language program for 8086 to exchange contents of two memory blocks

2 a Draw the timing diagrams for Read and Write operations in minimum and maximum mode [10]

b Explain hyper threading technology and its use in Pentium 4 [10]

3 a Interface DMA controller 8257 with 8086 MP. Explain different data transfer modes of 8257 DMAC [10]

b Write an ALP for 8086 to reverse a string of 10 characters. [10]

4 a Compare 80386,Pentium I ,Pentium 2 and Pentium 3 Processor. [10]

b Explain MESI protocol [10]

5 a Explain the Register organization of 80386. [10]

b Explain the Initialization command words (ICWs) and Operational command words (OCWs) of the 8259 PIC. [10]

6 a Design 8086 microprocessor-based on following Specifications: [10]

1. MP 8086 working at 10MHz minimum mode.
2. 32 KB ROM using 8 KB Devices
3. 16 KB RAM using 4KB chips

b Explain 8255 with a block diagram and its operating modes [10]

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SE-IV-IOT-R-19

QP: 10093321

(TIME: 03 HOURS)

(MAX. MARKS: 80)

Note:
1. Question **No. 1** is compulsory.
2. Attempt **any three** questions out of remaining **five** questions.
3. Assume suitable data wherever necessary.
4. Figures to right indicate full marks.

			Marks
Q.1	a.	Find the Eigen values of $A^3 - 3A^2 + A$ where $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$.	05
	b.	Evaluate *the integral* $\int_0^{1+i}(x - y + i x^2)$ dz along (i)the parabola $y^2 = x$ (ii) The line y = x.	05
	c.	Find the dual of the following L.P.P. Max. $z = 2x_1 - x_2 + 3x_3$ Subject to $x_1 - 2x_2 + x_3 \geq 4$, $2x_1 + 0x_2 + x_3 \leq 10$, $x_1 + x_2 + 3x_3 = 20$ $x_1, x_3 \geq 0$ x_2 unrestricted	05
	d.	Find the z-transform of $f(k) = \left(\frac{1}{3}\right)^{\lvert k \rvert}$.	05
Q.2	a.	Find the Eigenvalues and Eigenvectors of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.	06
	b.	The means of two random samples of size 9 and 7 are 196.42 and 198.82 Respectively. The sum of the squares of the deviations from the means are 26.94 and 18.73 respectively. Can the samples be considered to have been drawn from the same population?	06
	c.	Use the dual simplex method to solve the L.P.P. Minimize $z = 2x_1 + x_2$ Subject to $3x_1 + x_2 \geq 3$; $4x_1 + 3x_2 \geq 6$; $x_1 + 2x_2 \leq 3$; $x_1, x_2 \geq 0$	08
Q.3	a.	Find the relative maximum or minimum of the function $Z = x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$.	06
	b.	Find the Z-transform of $\{2^k \sin(3k + 2)\}$, $k \geq 0$.	06
	c.	Find all possible Laurent's expansion of $f(z) = \frac{7z-2}{z(z-2)(z+1)}$ about z = -1.	08

Q.4 a. Verify Cayley-Hamilton theorem for the matrix A and hence find A^{-1} and A^4 **06**

where $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$.

b. A die was thrown 132 times and the following frequencies were observed. **06**

No. obtained	1	2	3	4	5	6	**Total**
Frequency	15	20	25	15	29	28	**132**

Test the hypothesis that the die is unbiased.

c. Using the Kuhn –Tucker conditions to solve the N.L.P.P **08**

Maximize $z = 2x_1^2 - 7x_2^2 + 12x_1x_2$

Subject to $2x_1 + 5x_2 \leq 98;$

$x_1, x_2 \geq 0.$

Q.5 a. Using Cauchy's residue theorem evaluate $\int_c \frac{e^z}{(z^2+\pi^2)^2}\,dz$ **06**

where C is the circle $|z| = 4$.

b. Using the method of Lagrange's multiplier solve the N.L.P.P **06**

Optimize $z = 12x_1 + 8x_2 + 6x_3 - x_1^2 - x_2^2 - x_3^2 - 23$

Subject to $x_1 + x_2 + x_3 = 10.$

$x_1, x_2, x_3 \geq 0.$

c. 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. **08**

Q.6 a. Find the inverse z- transform of $F(z) = \frac{z}{(z-1)(z-2)}$, $|z| > 2$. **06**

b. Show that the matrix $A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$ is diagonalisable. Find the diagonal form D and diagonalizing matrix M. **06**

c. Solve the L.P.P by simplex method. **08**

Maximize $z = 3x_1 + 5x_2 + 4x_3$

Subject to $2x_1 + 3x_2 + 0x_3 \leq 8.$

$0x_1 + 2x_2 + 5x_3 \leq 10.$

$3x_1 + 2x_2 + 4x_3 \leq 15;$

$x_1, x_2, x_3 \geq 0.$

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QP code: 10099913

SE Sem IV th R-19 cscheme CSE(IOT)

Time: 3 hours **Marks: 80**

N.B. (1) Question one is Compulsory.
(2) Attempt any 3 questions out of the remaining.
(3) Assume suitable data if required.

Q. 1

a) What is the job sequencing with deadlines problem? Explain with an example how it can be solved using greedy approach. **(05)**

b) Explain the Divide and Conquer approach with a suitable example. **(05)**

c) Explain how the N-Queen's problem can be solved with backtracking using a suitable example. **(05)**

d) Solve the following recurrence relations using Master's method. **(05)**

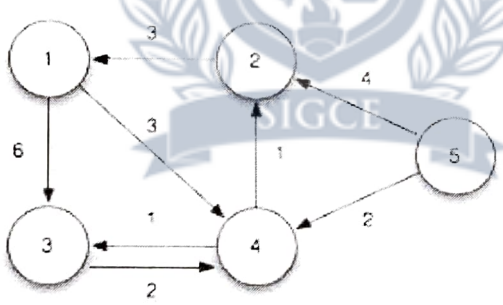
i. $T(n) = 2T(n/2) + n$

ii. $T(n) = 3T(n/4) + n^2$

Q. 2

a) What is the sum of subsets problem? Explain its working for the following example: n=5, W = {1, 4, 6, 9, 10} and target sum = 19. Use backtracking approach. **(10)**

b) Find the shortest path from vertex 1 to all other vertices using greedy approach. Show output after each iteration. **(10)**



Q. 3

a) Write an algorithm for Merge sort. Derive and discuss its time complexity for all cases. Explain the working of the Merge Sort algorithm with a suitable example containing at least seven elements in the list. Illustrate each step of the divide and conquer process, including both splitting and merging phases. **(10)**

b) What is the 15-puzzle problem? Explain with an example how this can be solved using Branch and Bound. **(10)**

Q. 4

a) Solve the following 0/1 Knapsack problem and give its optimal solution using dynamic programming: n = 4, Knapsack capacity M = 5, Weights W = {2, 1, 3, 2} and Profits V = {12, 10, 20, 15}. **(10)**

b) Explain the Rabin-Karp algorithm for string matching with a suitable example. Explain the concept and significance of spurious hit in Rabin-Karp algorithm? **(10)**

Q. 5

a) Write a detailed note on Big Oh, Omega and Theta notations. **(10)**

b) What is the LCS problem? Find the LCS for the following strings: X = "BARCELONA" Y = "BALTIMORE" using dynamic programming **(10)**

Q. 6 Write short notes on (any 2): **(20)**

a) P, NP, NP-Hard and NP-Complete Problems

b) Multistage graphs using dynamic programming

c) Minimum Spanning Tree using Kruskal's Algorithm

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