4E1301

4E1301

B.Tech. IV Sem. (Main/Back) Examination, July - 2023
Artificial Intelligence and Data Science
4AID2-01 Discrete Mathematics Structure
CS, IT, AID, CAI

Time : 3 Hours Maximum Marks : 70

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, Attempt any five questions out of Seven questions from **Part B** and three questions out of Five questions from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (As Mentioned in form No. 205).

PART - A
(Word limit 25)

All questions are compulsory. (10×2=20)

1. Prove that $A - B = B' \cap A'$. (2)

2. Define partial ordering relation with an example. (2)

3. Draw the truth table for $p \wedge q \rightarrow p \vee q$. (2)

4. Explain conjuctive normal form. (2)

5. Draw the Hasse diagram of the poset $(A, \leq)$ where A = {1,2,3,4,12} and the partial order of divisibility on A is $a \leq b$ (i.e. if a divides b). (2)

6. 8 boys and 5 girls constitute a group. In how many ways seven of them can be selected if the selections always have atleast 3 boys and 2 girls. (2)

7. If a,b are any elements of a group G, then prove that $(ab)^{-1} = b^{-1}a^{-1}$. (2)

8. If a is a generator of a cyclic group, then prove that a^{-1} is also its generator. (2)

9. Draw graph which is
   a. Eulerian but not Hamiltonian.
   b. Hamiltonian but not Eulerian. (2)

10. Define chromatic number. (2)

PART - B
(Word limit 100)

Attempt any Five questions. (5×4=20)

1. In a class of 60 students, 25 study Hindi, 26 study English and 26 study Sanskrit. Also 9 study both Hindi and Sanskrit, 11 study hindi and english and 8 study Englishh and Sanskrit. If 8 study none of the three subjects, Find number of students who study exactly one subject. (4)

2. Using principle of mathematical induction, prove that $1 + 2 + 2^2 + \ldots\ldots + 2^{n-1} = 2^n - 1$. (4)

3. Draw the transition diagram of finite state machine represented by following state table. Also find output word corresponding to input word w = 11011011. (4)

State	Transition	function	Output	function
	0	1	0	1
S_0	S_3	S_1	0	1
S_1	S_0	S_1	0	1
S_2	S_3	S_1	0	1
S_3	S_1	S_3	0	0

4. Solve the recurrence relation

   $a_r - 4a_{r-1} + 4a_{r-2} = 0$; $a_0 = 1$, $a_1 = 3$. (4)

5. Define isomorphism of groups. Prove that every subgroup of an abelian group is normal. (4)

6. Prove that the sum of degrees of all the vertices in a graph is equal to twice the number of edges in the graph. (4)

7. Prove that set of real numbers of the form $a + b\sqrt{2}$ (where a and b are integers) with ordinary addition and multiplication forms a ring. (4)
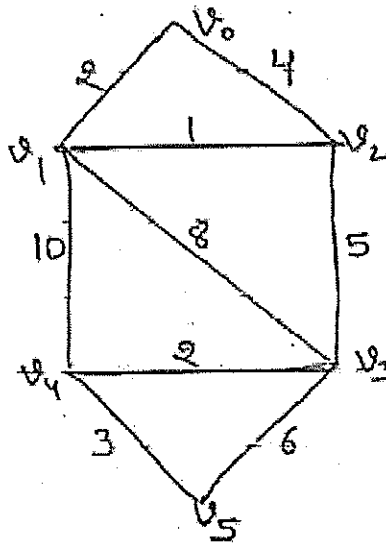
PART - C
Attempt any Three questions. (3×10=30)

1. In the set Z of integers, a relation R is defined by $aRb \Leftrightarrow a \equiv b(\bmod 4)$. Show that R is an equivalence relation. (10)

2. Define universal and existential quantifiers. prove that $p \to (q \wedge r) \equiv (p \to q) \wedge (p \to r)$. (10)

3. Prove that the dual of a lattice is also a lattice. (10)

4. Prove that the necessary and sufficient conditions for a non - void subset H of a group G to be a subgroup is that $a \in H, b \in H \Rightarrow ab^{-1} \in H$. **(10)**

5. Find the shortest path between the vertices v_0 and v_5 in the following weighed graph. **(10)**

4E1302

4E1302

B.Tech. IV Sem. (Main/Back) Examination, July - 2023
4AE1-03/ Managerial Economics and Financial Accounting /
All branches

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all ten questions from Part A, Attempt any five questions out of Seven questions from Part B and three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A
(Answer Should be given up to 25 Words only)

All questions are compulsory. (10×2=20)

1. Describe the principle of economics.
2. Discuss the word national income.
3. Define Monopolistic competition.
4. What is the importance of balance sheet.
5. Describe an Isoquant?
6. What is fund flow analysis?
7. What do you understand by scale of production?
8. Describe demand function.
9. Explain law of supply.
10. Define managerial economics.

PART - B
(Analytical/Problem Solving questions)

Attempt any Five questions. (5×4=20)
1. Differentiate between NI, GNP and GDP.
2. Discuss in detail on scarcity and choice.

3. List out the various types of price elasticity of demand and explain them.
4. How do total product, average product and marginal product change due to change in the use of one input and keeping other input constant?
5. Differentiate between explicit and Implicit cost.
6. Discuss in detail the features of monopoly market with its price curve.
7. Interpret the use of balance sheet highlight it with example.

PART - C
(Descriptive/Analytical/Problem Solving/Design question)
Attempt any Three questions.   (3×10=30)

1. Explain circular flow of 3 sector economy model.
2. Discuss elasticity of demand, also explain types of elasticity of demand with graphs.
3. Describe in detail :
   a. Law of variable proportions.
   b. Laws of returns to scale.
4. The following figures relates to trading activities of shipra Ltd for the year 31ˢᵗ March 2023 :

	Rs.		Rs.
Sales	10,00,000	Administrative expenses :	
Purchases	7,00,000	Salaries	30,000
Closing stock	1,40,000	Rent	6,000
Opening stock	1,10,000	Stationery and postage	2,000
Sales return	40,000	Depriciation	10,000
Selling and distribution expenses :		Other charges	20,000
Salaries	18,000	Provision for taxation	70,000
Advertising	7,000	Non operating income :	
Travelling	5,000	Dividend received	18,000
		Non operating expenses :	
		Loss on sale of shares	3,000

Prepare statement of profit and loss under as per part II of schedule II of companies act, 2015.

5. Discuss balance sheet and its importance with a suitable example.

4E1304

B.Tech. IV - Sem. (Main/Back) Examination, July - 2023
Computer Science and Engineering (AI)
4CAI3-04 Microprocessor and Interfaces
CS, AID, CAI

Time : 3 Hours   **Maximum Marks : 70**

Instructions to Candidates:

Attempt **all ten** questions from **Part A**, Attempt any **five** questions out of **Seven** questions from **Part B** and **three** questions out of **Five** questions from **Part C**.

Schematic diagrams must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (As Mentioned in form No. 205).

PART - A

(Word limit 25)

All questions are **compulsory**   (10×2=20)

1.   What is the clock frequency and duty cycle required for 8085?

2.   Write the uses of ALE and HOLD pins of 8085.

3.   What are the steps involved in instruction cycle?

4.   What is the use of temporary registers W and Z in 8085?

5.   What happen with stack pointer after executing two PUSH instructions?

6.   Name the different machine cycles.

7.   Which addressing mode is used in instruction STAX D?

8.   What is the use of RET instruction?

9.   List the operating modes of 8255 PPI.

10. What is PSW in 8085?

PART - B

(word limit 100)

Attempt any **five** questions   (5×4=20)

1. What are the different types of flags available in 8085? Explain in brief.

2. Draw the bus architecture of 8085 and explain.

3. Discuss bidirectional handshaking in 8255 PPI.

4. Draw and explain the timing diagram for memory write machine cycle.

5. Explain various addressing modes in 8085 with suitable example.

6. Write a delay subroutine using 8 bit register. What is the maximum possible delay obtainable.

7. Differentiate between Macro and Subroutine.

PART - C

Attempt any **Three** questions   (3×10=30)

1. Draw the architecture of 8085 and explain each block clearly.

2. Write a program to transfer a block of memory data starting from one memory location to another memory location in reverse order.

3. Explain the use of control word for 8254 PIT.

4. Draw the architecture of 8259 PIC and explain.

5. Write technical note on RS422A and IEEE488.

B.Tech. IV Sem. (Main) Examination, - July 2023
Computer Science and Engineering (AI)
4CAI4-05 Database Management System
CS, IT, AID, CAI

Time : 3 Hours   Maximum Marks : 70

Instructions to Candidates:

Attempt *all ten* questions from **Part A**, Attempt any *five* questions out of *Seven* questions from **Part B** and *three* questions out of *Five* questions from **Part C**.

Schematic diagrams must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (As Mentioned in form No. 205).

PART - A

(Word limit 25)

All questions are compulsory   (10×2=20)

1. Write any four differences between file system and DBMS.

2. Draw state diagram of transaction.

3. What is ODBC? How does it differ from JDBC?

4. Consider a relation R(A,B,C,D,E) with A,B,C,D,E as attributes and functional dependency set $F = \{AB \to C, C \to D, B \to E\}$. Find out the candidate key.

5. How does weak entity differ from strong entity in ER model?

6. Explain various levels of data abstractions in DBMS.

7. How does correlated nested queries differ from simple nested queries. Explain with example.

8. Explain Aggregation with example.

9. Differentiate Generalization and Specialization.

10. In which applications, Embedded and Dynamic SQL are required?

PART - B

(Word limit 100)

Attempt any **five** questions   (5×4=20)

1. Explain following joins with help of example -

   i.   Theta join.   ii. Equi Join.

   iii. Natural join.   iv. Outer join.

2. How does triggers are useful in DBMS? Write a trigger in SQL to confirm value inserted in age field of a table is not less than 18 before inserting value.

3. Explain the role and importance of relational algebra. Also explain six basic operators of relational algebra with example.

4. Explain all six inference rules for functional dependency with example.

5. Consider the following schedule of three transactions T1, T2, T3 where X and Y are data items.

T1	T2	T3
	R(X)	
		R(X)
W(Y)		
	W(X)	
		R(Y)
	W(Y)	

   Using precedence graph, find out whether the schedule is conflict serializable or not?

6. Explain irrecoverable and recoverable schedules with example.

7. Explain following keys with example -

   a. Primary key   b. Candidate key.

   c. Super key   d. Foreign key.

PART - C

Attempt any **Three** questions   (3×10=30)

1. How does various E-R model constructs relate to relation model construct. Draw the detailed E-R model for library management system and then convert this ER model to relational model by mapping various constructs.

2. Consider the relations defined below :

DOCTOR (regno, name, telno, city, specialization).

PATIENT (pname, street, city)

VISIT (pname, regno, data _of_visit, fee)

Where the regno and pname fields identify the doctor and the patient uniquely respectively. Express following queries in SQL -

a. Get the name and regno of doctors who live in Kota. (1)

b. Find the name and city of patient(s) who visited a doctor on date 12 - Aug - 2022. (1)

c. Find out all doctors whose name start with letter 'n'. (1)

d. Find doctors whose specialization in 'NEURO'. (1)

e. Find out total number of patients visited by each doctor. (2)

f. Print patient name and doctor name to whom he has visited for treatment.(2)

g. Find out name of doctors who have not visited any patient yet. (2)

3. Explain Shadow paging and log based recovery techniques with advantages and disadvantages of each.

4. What is normalization? Explain all types of normal forms with example?

5. Write short note on following concurrency control schemes :

a. Lock - based protocol.

b. Timestamp based protocol.

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4E1306

4E1306

B.Tech. IV-Sem. (Main/Back) Examination, July - 2023
Computer Science and Engineering
4CS4-06 Theory of Computation
CS, IT, AID, CAI

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Attempt any Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination (As Mentioned in form No. 205).

PART - A
### (Word limit 25)

All questions are **compulsory.** (10×2=20)

1. Give the mathematical definition of finite automaton.

2. Construct an NFA, with the specified number of states, that accepts the language {w : w ends with 10} with three states.

3. Write a regular expressions over {0,1} consisting of strings that contain exactly two 1's.

4. Prove $(1+00*1)+(1+00*1)(0+10*1)* (0+10*1) = 0*1(0+10*1)*$.

5. Explain why the grammar given below is ambiguous.

$S \to 0A|1B, A \to 0AA|1S|1, B \to 1BB|0S| 0$

6. What is difference between Finite State Automaton and Pushdown Automaton?

7. Explain the Chomsky Hierarchy in details.

8. Can all computational problems solved by computer?

9. What is Halting Problem?

10. List the problems belonging to polynomial class.

PART - B

(Word limit 100)

Attempt any **Five** questions.   (5×4=20)

1. Convert the following NFA to an equivalent DFA.
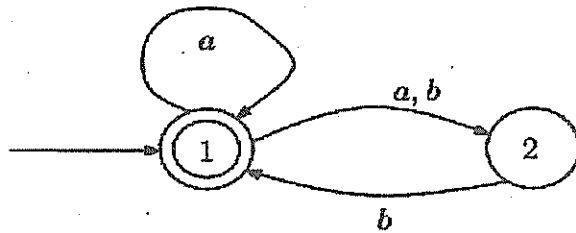
2. Design a Mealy Machine that computes 2's complement of the given binary input number.

3. Use the pumping lemma to prove that the following languages is not regular.

    $\{a^n b^n : n \geq 0\}$

4. Let G be the grammar S->0B|1A.A->0|0S|1AA, B->1|1S|0BB.For the string 00110101, find (a) the leftmost derivation, (b) the rightmost derivation, and (c) the derivation tree.

5. Design a PDA accepting $\{a^n b^m c^n \quad m, n \geq 1\}$ by null store

6. Consider the TM description given M as shown in table. Draw the computation sequence of the input string 00.

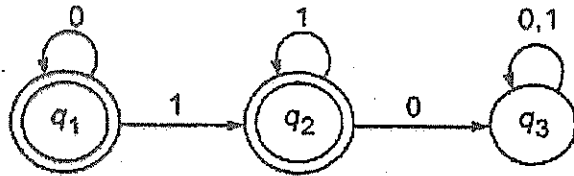| Present State	Tape symbol		
	b	0	1
$\rightarrow q_1$	$1Lq_2$	$0Rq_1$	
q_2	bRq_3	$0Lq_2$	$1Lq_2$
q_3		bRq_4	bRq_5
q_4	$0Rq_5$	$0Rq_4$	$1Rq_4$
(q_5)	$0Lq_2$		

7. Write a note on Tractable and Untractable Problems.

PART - C

Attempt any Three questions. (3×10=30)

1. Describe in English the set accepted by the finite automaton whose transition diagram is as shown in following figure.

2. Consider the context-free grammar $G = (S, \Sigma, V, P)$, where $V = \{S,B\}$,

$\Sigma = \{0, 1\}$, S is the start variable, and P consists of the rules $S \to BSB|B|\varepsilon$, $B \to 00|\varepsilon$ convert this grammar to a context-free grammar in Chomsky normal form whose language is the same as that of G. Throughout the construction, upper case letters will denote variables.

3. Let $\Sigma = \{int, +, *, (,)\}$ and consider the language ARITH = $\{w \in \Sigma * |$ w is a legal arithmetic expression$\}$ Design a PDA that accepts the int + int* int, ((int + int)*(int+int))+(int) types of arithmetic expression?

4. Design a Turing machine over $\{1,b\}$ which can compute a concatenation function over $\Sigma = \{1\}$. If a pair of words (w_1, w_2) is the input and the output has to be $w_1 w_2$.

5. Explain the traveling salesperson problem? Why this problem is NP-complete?

| 4E1307 |

B.Tech. IV - Sem. (Main/Back) Examination, July - 2023
Artificial Intelligence and Data Science
4AID4-07 Data Communication and Computer Networks
CS, IT, AID, CAI

Time : 3 Hours   Maximum Marks : 70

Instructions to Candidates:

Attempt all ten questions from Part A, Attempt any five questions out of Seven questions from Part B and three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (As Mentioned in form No. 205).

Part - A
(Word limit 25)

All questions are **compulsory.**   (10×2=20)

1. What is piggybacking?
2. Write use of checksum to find errors in data packet.
3. Differentiate digital and analog signals.
4. What is FTP?
5. Differentiate virtual circuit subnets and datagram subnets.
6. What is jitter?
7. What are the key elements of network protocols?
8. What are cyclic codes?
9. Explain DHCP in brief.
10. Differentiate gateway and routers.

Part - B
(Word limit 100)

Attempt any five questions   (5×4=20)

1. What is optimality principle? Explain link state routing algorithm.
2. Explain the concept of fragmentation. Why fragmentation is done and how?

3. What is guided transmission media? Explain Coaxial cable.
4. Describe selective repeat ARQ with example.
5. What is DNS? Explain its functioning.
6. Explain the term "Three Way Handshake" in Transport layer connection management.
7. What is silly window syndrome problem? Describe Clark's solution.

Part - C

Attempt any **Three** questions   (3×10=30)

1. Explain OSI network model in detail.
2. How congestion is controlled at network layer? Explain leaky bucket algorithm.
3. Explain TCP header format. Differentiate TCP and UDP.
4. Explain Carrier sense multiple Access protocol (CSMA). Differentiate CSMA and ALOHA.
5. What is POP3? Explain how it is different from SMTP.