

Total No. of Questions : 22

Total No. of Pages : 02

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B.Tech IV sem (Main/Back) Exam April-May 2026

Artificial Intelligence & Data Science

4AID2-01 Discrete Mathematics Structure

Paper Code : 4E1301

CS, IT, AID, CAI, CCS, CDS, CIT, CSR

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, 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)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory

- Q.1 Define countable set. T-480
- Q.2 Define into and onto function.
- Q.3 What do you mean by “conjunction” connection $(p \wedge q)$.
- Q.4 Define finite state machine.
- Q.5 Define well ordered set.
- Q.6 From 6 boys and 4 girls, 5 are to be selected for admission for a particular course. In how many ways can this be done if there must be exactly 2 girls.
- Q.7 Define abelian group.
- Q.8 Define Homomorphism of group.
- Q.9 Define planer graph.
- Q.10 Define chromatic number. 10 x 2 = 20

Part B (Analytical/Problem solving questions)

Attempt any Five questions

T-480

- Q.1 The relation R on the set S of all real numbers is define as : a R b is and only if $1+ab > 0$. Show that this relation is reflexive and symmetric not transitive.
- Q.2 In a group of 52 person, 16 drink tea but not coffee and 33 drink tea. Find
- How many drink tea and coffee both
 - How many drink coffee but not tea.
- Q.3 Prove that $(p \Rightarrow q) \vee r \equiv (p \vee r) \Rightarrow (q \vee r)$
- Q.4. Let $A = \{2,3,4,6,12,36, 48\}$ be a non empty set and R be the partial order relation on divisibility defined on A, i.e. if a, b $\in A$ then a divides b.
- Draw the graph and Hasse diagram.

- Q.5 Explain bounded and complimented lattices.
Q.6 Prove that every cyclic group is abelian.
Q.7 Explain Eulerian and Hamiltonian graph.

5x 4 = 20

Part C(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1 Prove by the principle of mathematical induction :

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

- Q.2 Let M be a finite state machine with state table given below :

State	f (input)		g (output)	
	a	b	a	b
S ₀	S ₁	S ₂	x	x
S ₁	S ₀	S ₁	x	y
S ₂	S ₁	S ₂	y	x
S ₃	S ₁	S ₂	y	y

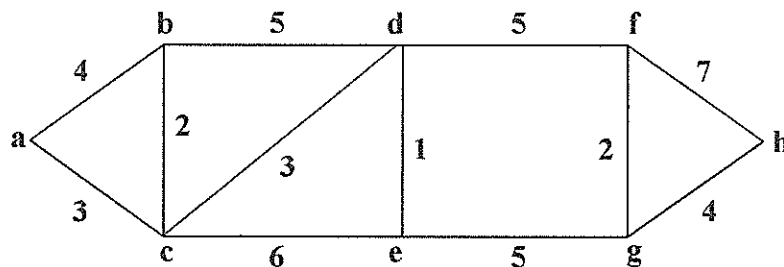
- (i) Find the input set I , the state set S, the output set o and the initial state of M.
(ii) Draw the state diagram of M.
- Q.3 Solve the recurrence relation.

$$a_n - 8a_{n-1} + 16a_{n-2} = 0$$

with initial condition $a_2=16, a_3=80$.

- Q.4 Show that set of all square matrix of order (mxn) under the binary operations addition and multiplication is a non commutative ring.

- Q.5 Find the shortest path and its length between the vertices a and h in the following weighted graph:



3 x 10= 30

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B.Tech IV sem (Main/Back) Exam April-May 2026

Artificial Intelligence & Data Science

4AID3-04 Microprocessor & Interfaces

Paper Code : 4E1304

CS, AID, CAI, CCS, CDS, CIT, CSR

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, 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)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory

T-480

- Q.1 What is a microprocessor based computer?
- Q.2 Explain de-multiplexing of buses.
- Q.3 What is meant by liquid crystal display?
- Q.4 Why do you need 8255 chip?
- Q.5 What are direct addressing modes?
- Q.6 What is an instruction cycle?
- Q.7 Is there a relation between T state, machine cycle & frequency?
- Q.8 What are serial/parallel interfaces?
- Q.9 Define macro in microprocessor 8085.
- Q.10 What do you mean by machine language?

10 x 2 = 20

Part B (Analytical/Problem solving questions)

Attempt any Five questions

- Q.11 State the difference between Trap and other interrupts.
- Q.12 State the difference between Centronics and IEEE488 parallel interfaces.
- Q.13 Explain the classification of instructions in general.
- Q.14 Draw the Flag register format and explain the individual flags.
- Q.15 Explain memory interfacing in microprocessor 8085.
- Q.16 Explain RIM format.
- Q.17 Write a program to subtract two 8-bit numbers.

5x 4 = 20

Part C (Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.18 Write a program to add seven 8-bit numbers located at C020 onwards. Place the result at location C200 onwards.
- Q.19 Describe the working of 8279 chip.
- Q.20 Explain the different modes of working of 8259 chip.
- Q.21 What is the use of USART 8251? Explain its working.
- Q.22 Write a program to place a list of 6 data from location C400 onwards to C700 onwards.

3 x 10= 30

Total No. of Questions : 22

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B.Tech IV sem (Main/Back) Exam April-May 2026

Artificial Intelligence & Data Science

4AID4-05 Database Management System

Paper Code : 4E1305

CS, IT, AID, CAI, CCS, CDS, CIT, CSR

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, 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)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory

T-480

- Q.1 Define DBMS.
- Q.2 What is DBA? Mention the functionalities of DBA.
- Q.3 Why do we need normalization?
- Q.4 Define entity and attribute in ER model.
- Q.5 What is weak entity and strong entity?
- Q.6 What is selection and projection operation in relational algebra?
- Q.7 What is a nested query in SQL? What are the types of nested queries?
- Q.8 Define functional dependency with the help of an example.
- Q.9 What is a transaction?
- Q.10 What is deadlock in DBMS?

10 x 2 = 20

Part B (Analytical/Problem solving questions)

Attempt any Five questions

- Q.1 Explain File System vs DBMS.
- Q.2 Describe key constraints and participation constraints in ER model.
- Q.3 Explain different types of joins in relational algebra.
- Q.4 Explain about the following clauses with example queries.
T-480
 - (i) Group by
 - (ii) Order by
 - (iii) Aggregation functions.
- Q.5 Explain Boyce-Codd Normal Form (BCNF).
- Q.6 Describe ACID properties of a transaction.
- Q.7 Explain conflict serializability with the help of an example

5x 4 = 20

Part C (Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1 Design an ER diagram for a university database and explain all components.
- Q.2 a) Draw and explain the detailed system architecture of DBMS.
b) What are the advantages of DBMS?
- Q.3 Explain normalization process with 1NF and 2NF with examples
- Q.4 Explain Wait/Die and Wound/Wait Schemes in transaction management.
- Q.5 a) Differentiate specialization and generalization.
b) Consider the following database schema to write queries in SQL
Sailor (sid, sname, age, rating)
Boats (bid, bname, bcolor)
Reserves (sid, bid, day)
i) Find the sailors who have reserved a red boat
ii) Find the names of the sailors who have reserved at least two boats
iii) Find the colors of the boats reserved by 'Mohan'

3x10= 30

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B.Tech IV sem (Main/Back) Exam April-May 2026**Artificial Intelligence & Data Science****4AID4-06 Theory of Computation****Paper Code : 4E1306****CS, IT, AID, CAI, CCS, CDS, CIT, CSR****Time: 3 Hours****Maximum Marks: 70**

Attempt all ten questions from Part A, 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)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)**All questions are compulsory** T-480

- Q.1 Define a FA which checks whether the given binary number is even.
- Q.2 Give application of pumping lemma.
- Q.3 State parse tree with example.
- Q.4 Show that the following grammar is ambiguous or not : $S \rightarrow aSbS / bSaS / \epsilon$.
- Q.5 Write three properties of CFL.
- Q.6 What is the difference between finite automata and pushdown automata ?
- Q.7 Define the recursive and recursively enumerable languages.
- Q.8 Prove the transpose closure property of context sensitive language.
- Q.9 Define NP complete and NP hard problem.
- Q.10 Define Cook's theorem and its application.

10 x 2 = 20

Part B (Analytical/Problem solving questions)**Attempt any Five questions** T-480

- Q.1 Convert the following Moore machine into Melay machine -

State Input output

a b

$\rightarrow q_0$	q_1	q_3	1
q_1	q_3	q_1	0
q_2	q_0	q_3	0
q_3	q_3	q_2	1

- Q.2 Construct the finite automation equivalent to the regular expression $(a+b)^* a b^* a (a+ba)^*$.
T-480
- Q.3 Explain context free grammar. Also differentiate it from context sensitive language.
- Q.4. Convert the following context free Grammar (CFG) into a equivalent CFG in Chomsky normal form :

$$S \rightarrow ASA | aB$$

$$A \rightarrow B | S$$

$$B \rightarrow b | \epsilon$$
- Q.5 Design PDA for accepting $\{a^n b^n c^m d^m | n, m \geq 1\}$.
- Q.6 Design a Turing machine M to recognize the language $\{a^n b^n | n \geq 1\}$.
T-480
- Q.7 Explain travelling salesman problem with example.

5 x 4 = 20

Part C (Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1 Differentiate between deterministic and non deterministic finite automation. Find the equivalent DFA for the NFA given by $M = [\{A, B, C\}, (a, b), \delta, A, \{c\}]$ where δ is given by :

	A	b
→ A	A, B	C
B	A	B
C	-	A, B

- Q.2 Given grammar G

$$S \rightarrow a B | b A$$

$$A \rightarrow a | a S | b A A$$

$$B \rightarrow b | b S | a B B$$
Derive the string "baaabbabba" find left most derivation, right most derivation and parse tree.
- Q.3 How can a pushdown automata be constructed for a given language ? Explain with example.
- Q.4 Explain Chomsky classification of language with the help of suitable example.
- Q.5 Write algorithm for approximation for vertex cover problem with suitable example.

3 x 10 = 30

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B.Tech IV sem (Main/Back) Exam April-May 2026
Artificial Intelligence & Data Science
4AID4-07 Data Communication and Computer Networks
Paper Code : 4E1307
CS, IT, AID, CAI, CCS, CDS, CIT, CSR

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, 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)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory

T-480

- Q.1. Differentiate Analog and Digital signal.
- Q.2. What is peer - to - peer process?
- Q.3. Define piggybacking?
- Q.4. Differentiate between single bit error and burst bit error.
- Q.5. What is Jitter?
- Q.6. What is the use of RJ-45 connector?
- Q.7. Write uses of Leaky Bucket Algorithm.
- Q.8. Write any two differences between UDP and TCP.
- Q.9. Differentiate gateway and routers.
- Q.10. Write use of checksum to find errors in data packets.

10 x 2 = 20

Part B (Analytical/Problem solving questions)

Attempt any Five questions

- Q.1. Explain OSI reference model with suitable diagram.
- Q.2. What is topology? Explain types of topologies with suitable diagram.
- Q.3. Describe selective repeat ARQ with example. T-480
- Q.4. Explain ARP and RARP address mapping protocols.
- Q.5. Consider the delay of pure ALOHA versus slotted ALOHA at low load. Which one is less?

Explain your answer.

- Q.6. Write short note on

(a) CSMA/CD

(b) Architecture of WWW

- Q.7. What is guided transmission media? Explain Coaxial cable.

5x 4 = 20

Part C (Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1. Explain the working of the following CSMA protocol in detail.
- (a) 1-Persistent
 - (b) Non- Persistent
 - (c) P- Persistent
- Q.2. Explain TCP header format. Differentiate TCP and UDP.
- Q.3. What is ALOHA? Explain pure and slotted ALOHA. A pure aloha network transmits 200 bits frames on a shared channel of 200 kbps. What is the throughput if the system produces 1000 frames per second?
- Q.4. Write short note on -
- (a) DNS
 - (b) Sliding window protocol
 - (c) Stop and wait ARQ
- Q.5. Explain the IPv4 header with IPv6 header. Also write the difference between IPv4 and IPv6.

3x10= 30

Total No. of Questions : 22

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B.Tech IV sem (Main/Back) Exam April-May 2026
Aeronautical Engg.
4AN1-03 Managerial Economics & Financial Accounting
Paper Code : 4E1302
All Branches

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, 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)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)
All questions are compulsory

T-480

- Q. 1 Define Managerial Economics.
- Q.2 What is the meaning of demand ?
- Q.3 Define monopoly?
- Q.4 What is the meaning of Cash Flow analysis?
- Q.5 What is the meaning of Oligopoly?
- Q.6 Define Financial statement analysis ?
- Q.7 Define opportunity cost ?
- Q.8 What is the meaning of survey method ?
- Q.9 What is payback Period ?
- Q.10 Define Managerial Economics.

10 x 2 = 20

Part B (Analytical/Problem solving questions)
Attempt any Five questions

- Q.1 Discuss the importance of Managerial Economics in decision making.
- Q.2 Define 'Demand' and explain the factors that influence the demand of product.

- Q.3 Calculate the BEP in units and rupees using the following details :
- Selling price per unit Rs. 100 .
 - Variable cost per unit Rs. 60.
 - Fixed cost Rs. 20,000
 - Actual sales Rs. 2,00,000
- Q.4. Discuss the various concept of National income- Gross National products, Net National Product, Personal income and dispensable Income.
- Q.5 Define Balance Sheet ? Give two characteristics of Balance Sheet ?
- Q.6 Distinguish between Monopolistic competition and Perfect Competition ?
- Q.7 You are required to calculate.
- i) Margin of Safety
 - ii) Total sales
 - iii) Variable cost from the following figures
 - Fixed costs Rs. 12, 000
 - Profit Rs. 1,000
 - Break-Even Sales Rs. 60,000

5 x 4 = 20

Part C(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1 Define **Ratio Analysis**. Explain the importance of Liquidity and Profitability ratio for a firm.
- Q.2 How the price and output is determined under the perfect competition during the short period ?
- Q.3 Explain the concept of Market Equilibrium the context of Demand and Supply. Discuss how changes in demand and supply affect equilibrium price and quantity. Use diagrams to illustrate your answer.
- Q.4 Calculate the Net present value (NPV) of the two projects X and Y. Suggest which of the two projects should be accepted assuming a discount rate of 10%.

Item	Project -A	Project-B
Initial Investment	Rs. 80,000	Rs. 1,20,000
Life Period	5 years	5 years
Scrap Value	Rs. 4,000	Rs.8000
(Annual Cash Inflows)	(CFAT)	(CFAT)
Year : 1	Rs. 24,000	Rs. 70,000
, 2	Rs. 36,000	Rs. 50,000
, 3	Rs. 14,000	Rs. 24,000
, 4	Rs. 10,000	Rs.8,000
, 5	Rs. 8,000	Rs.8,000

- Q.5 Define **Managerial Economics** and discuss its nature, scope, and relationship with other disciplines like statistics and Mathematics.

3 x 10= 30

Total No. of Questions : 22

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B.Tech IV sem (Main/Back) Exam April-May 2026

Aeronautical Engg.

4AN1-02 Technical Communication

Paper Code : 4E1303

All Branches

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, 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)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory

T-480

- Q. 1 What is Ideation in the process of Technical communication ?
- Q.2 What do you mean by Linguistic Competence ?
- Q.3 What is SQ3R Reading Technique ? Who developed this technique ?
- Q.4 Name any four graphic aids generally used in technical document ?
- Q.5 How will you ensure maximum engagement and share while preparing the online content ?
- Q.6 Define technical discourse.
- Q.7 What do you mean by the term Minutes of Meeting ?
- Q.8 What is Topicalising in the process of note making?
- Q.9 What does the term 'BCC' mean in the heading of an email ?
- Q.10 What is the main purpose of report writing? 10 x 2 = 20

Part B (Analytical/Problem solving questions)

Attempt any Five questions

- Q.1 What are the aspects of effective technical communication ?
- Q.2 How does active reading differ from passive reading ?
- Q.3 Reading is a complex communication process of receiving and interpreting the written word Elaborate.
- Q.4. What are the factors which affect the information and document design?
- Q.5 Correct the following sentences :
 - (i) Neither of the boys are selected for the final
 - (ii) The people of South India loves their tradition and follows them whole-heartedly.
 - (iii) Sartia is more better than Hari in playing chess.
 - (iv) What a terrible night it is ?

- Q.6 What are the main steps that are involved in summarizing technical texts ?
Q.7 What do you mean by the term Methodology in technical articles ?

5 x 4 = 20

Part C(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

T-480

- Q.1 Write short notes on following :
- Literature survey and data collection.
 - Difference between report and a Proposal.
 - Strategies for reading technical text.
 - Internal and External Proposals.
- Q.2 Assume yourself as Shashwat Sharma, a B. Tech. student from MNIT Jaipur. Write an email message to Mr. Ayush Bhatia personnel manager of NTPC Power Management Institute at Noida, U.P. requesting him to allow you to do summer training there as a part of your academic assignments.
- Q.3 Suppose you want to avail a study loan from State Bank of India. Write a letter to the Chief Manager, SBI branch of your locality requesting him/her to send you all the information related to the loan.
- Q.4 What are the types of Technical Report ? Mention the structure of a format Report ?
- Q.5 What is the importance of Technical communication in engineering? How can clear, concise and accurate documentation contribute to the success of engineering projects?

3 x 10= 30