Discrete Maths Important Questions PDF

The most important Discrete Mathematics questions are proofs on sets and relations, equivalence relations and partial orders, Hasse diagrams and lattices, functions and the pigeonhole principle, propositional logic with truth tables and normal forms, rules of inference, groups, subgroups and Lagrange's theorem, graph theory (Euler and Hamilton paths, planar graphs, colouring), trees, recurrence relations and generating functions.

Key takeaways

- Proof questions (sets, relations, groups) and numericals (recurrences, counting) appear in almost every paper.
- Write every proof in clear steps with a reason for each line.
- Practise drawing Hasse diagrams and checking whether a poset is a lattice.
- These are practice questions, not past papers; check your own syllabus and official previous papers.

About these important questions

This page lists the most important Discrete Mathematics questions for B.Tech CSE and IT exams, arranged unit by unit. The units follow the standard syllabus that most Indian technical universities share, so the order may differ slightly from yours.

Please note: these are practice questions based on common syllabus topics. They are not verified past papers, and we do not claim that any question will appear in your exam. Check your own university syllabus first, then solve the official previous year papers. AKTU students can download them from the AKTU old question paper archive.

Unit 1: Sets, Relations and Functions

Covers set operations, relations and their properties, and functions.

Short questions (2 marks)

- Define a power set and find P({a, b, c}).
- State De Morgan's laws for sets.
- What is an equivalence relation?
- Differentiate between one-to-one and onto functions.

Long questions

1. Prove that $(A \cup B)' = A' \cap B'$ using a membership table or element argument.
2. Show that a given relation on integers (for example, $a \equiv b \bmod 5$) is an equivalence relation and find its classes.
3. Find the reflexive, symmetric and transitive closure of a relation. Use Warshall's algorithm for the transitive closure.
4. Show that a given function is a bijection and find its inverse.
5. State and prove the pigeonhole principle, with an application.
6. Use the principle of inclusion and exclusion to count integers from 1 to 1000 divisible by 3, 5 or 7.

Unit 2: Algebraic Structures

Covers groups, subgroups, cosets, rings and fields.

Short questions (2 marks)

- Define a semigroup, monoid and group.
- What is an abelian group?
- Define the order of an element.

Long questions

1. Show that the set $\{1, -1, i, -i\}$ is a group under multiplication.
2. State and prove Lagrange's theorem.
3. Prove that every cyclic group is abelian, and that the intersection of two subgroups is a subgroup.
4. Explain cosets and normal subgroups with examples.
5. Define a homomorphism and an isomorphism, and prove a basic property.
6. Define a ring and a field with examples, and explain an integral domain.

Unit 3: Posets, Lattices and Boolean Algebra

Covers partial orders, Hasse diagrams, lattices and Boolean functions.

Short questions (2 marks)

- Define a partially ordered set (poset).
- What is a distributive lattice?
- State the duality principle in Boolean algebra.

Long questions

1. Draw the Hasse diagram of the divisors of 36 (or 24) under divisibility, and find maximal, minimal, greatest and least elements.
2. Check whether a given poset is a lattice. Find the LUB and GLB of chosen pairs.
3. Prove that every chain is a distributive lattice.
4. Simplify a Boolean function using Boolean laws and using a K-map.
5. Express a Boolean function in sum-of-products and product-of-sums canonical forms.

Unit 4: Propositional and Predicate Logic

Covers logic, normal forms, inference and quantifiers.

Short questions (2 marks)

- Define a tautology and a contradiction.
- Write the converse, inverse and contrapositive of an implication.
- Negate the statement "for all x, P(x)".

Long questions

1. Show that $(p \to q) \land (q \to r) \to (p \to r)$ is a tautology using a truth table and using laws of logic.
2. Find the PDNF and PCNF of a given formula.
3. Test the validity of an argument using rules of inference.
4. Translate English statements into predicate logic with quantifiers.
5. Prove a statement using mathematical induction, for example $1 + 2 + \dots + n = n(n + 1)/2$.

Unit 5: Graphs, Trees, Recurrences and Combinatorics

Covers graph theory, trees, recurrence relations and counting. Some universities split this into two units.

Short questions (2 marks)

- State the handshaking lemma.
- What is a planar graph? State Euler's formula.
- Define the chromatic number.

Long questions

1. Explain Euler and Hamiltonian paths and circuits, with the conditions for each.
2. Prove that a connected planar graph satisfies $V - E + F = 2$.
3. Check whether two graphs are isomorphic.
4. Find the minimum spanning tree of a weighted graph.
5. Solve the recurrence $a(n) = 5a(n-1) - 6a(n-2)$ with $a(0) = 1$, $a(1) = 0$, and a non-homogeneous recurrence.
6. Use generating functions to solve a recurrence.
7. Solve permutation and combination problems, including arrangements with repetition.

Sample answer outline: Solving a linear recurrence relation

Take $a(n) = 5a(n-1) - 6a(n-2)$ with $a(0) = 1$ and $a(1) = 0$. A full answer has these steps:

1. **Write the characteristic equation.** Replace $a(n)$ with r^n: $r^2 - 5r + 6 = 0$.
2. **Find the roots.** $(r - 2)(r - 3) = 0$, so $r = 2$ and $r = 3$. The roots are distinct.
3. **Write the general solution.** $a(n) = A \cdot 2^n + B \cdot 3^n$.
4. **Use the initial conditions.** $a(0) = A + B = 1$ and $a(1) = 2A + 3B = 0$. Solving gives $A = 3$ and $B = -2$.

5. **State the answer.** a(n) = 3·2^n - 2·3^n. Check it: a(2) = 12 - 18 = -6, and the recurrence gives 5(0) - 6(1) = -6.

For repeated roots, use (A + Bn)r^n. For a non-homogeneous term such as 2^n, find a particular solution and add it to the homogeneous one. If the term matches a root, multiply the guess by n.

Marks weightage and how to write answers

A common pattern, used by AKTU and many other universities, has a compulsory short-answer section that covers every unit, followed by long-answer questions with a choice inside each unit. Marks per question change between universities and years, so confirm the scheme on a recent official paper.

- **Short answers (about 2 marks):** a crisp definition, one example or diagram, and nothing more. Three to five lines is enough.
- **Long answers (7 to 10 marks):** start with a definition, add a labelled diagram or table, explain the steps, and finish with an example, advantages or a comparison.
- In proofs, write "To prove", the steps with reasons, and end with "Hence proved". This structure earns method marks even if one step slips.
- For Hasse diagrams, remove reflexive and transitive edges and keep smaller elements lower.

A 7-day revision plan for Discrete Mathematics

1. **Days 1 to 5:** one unit a day. Read your notes, then write the long answers for that unit from memory and check them against your notes.
2. **Day 6:** redo one problem each on equivalence classes, Lagrange's theorem, Hasse diagrams, normal forms and recurrence relations.
3. **Day 7:** solve one full official previous year paper in three hours, then check which units cost you time.

Keep a single sheet of formulas, definitions and diagrams for the last hour before the exam.

Frequently asked questions

Which Discrete Mathematics topics are most important?

Relations and equivalence classes, posets and lattices, groups and Lagrange's theorem, propositional logic and normal forms, graph theory and recurrence relations are asked most often.

How do I score well in Discrete Mathematics proofs?

Learn the standard proofs (Lagrange's theorem, Euler's formula, properties of groups) and write them in numbered steps with a reason for each. Practise induction proofs, since they are easy marks.

Why is Discrete Mathematics taught in CSE?

It is the base for algorithms, databases, cryptography, compilers and machine learning. Logic, graphs and counting show up across later subjects.

Are these Discrete Mathematics questions from previous year papers?

No. They are practice questions built from topics that appear in most B.Tech Discrete Mathematics syllabi. Use them with your own university's official previous papers, for example the AKTU archive at https://aktu.ac.in/old-question-paper.html.

Is this PDF free?

Yes. Fill in the short form on this page and the PDF downloads right away.

Sources and further reading

- AKTU: old question papers (official archive)
- MIT OpenCourseWare: Mathematics for Computer Science (6.042J)
- NPTEL: online courses from IITs (search for Discrete Mathematics)

About this PDF

These are practice questions for revision, prepared by the Uncodemy trainer team from common B.Tech syllabus topics. They are not past papers, a certificate or a promise of marks. Spot an error? Write to info@uncodemy.com and the team will review it.

More free resources and courses: uncodemy.com | info@uncodemy.com | +91 98183 66550