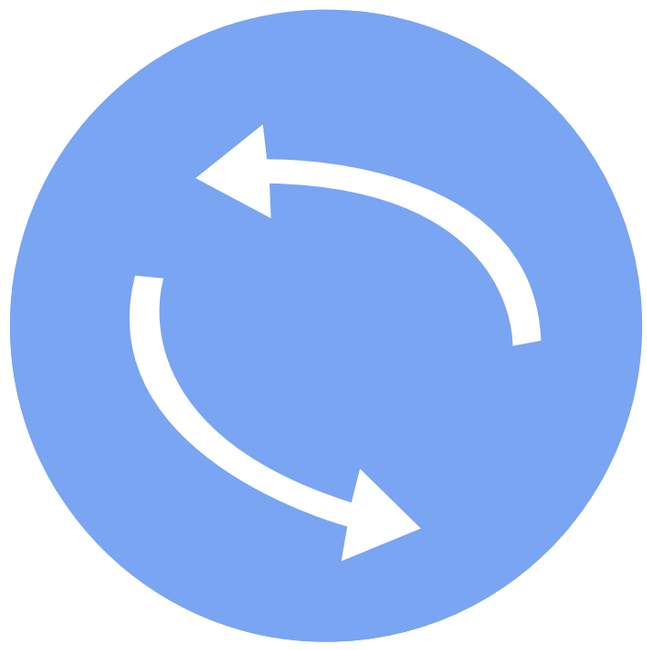
IGNOU

MCS-212

30 MOST REPEATED QUESTIONS



Curated List of 30 Questions that are seen to be repeated frequently in the examinations.

By **FarLearner.com**

MCS-212 Most Repeated Questions

1 . Using proof by contradiction, demonstrate that the square root of a number (such as 2, 3, or 5) is irrational.
Found in Dec 2021 (1 b), Dec 2024 (1 a), June 2025 (1 b)

Answer : Assume $\sqrt{2}$ is rational.

Then it can be written as p/q where p and q are integers with no common factors and q≠0.

$\sqrt{2} = p/q$

Squaring both sides:

$2=p^2/q^2$

$p^2=2q^2$

Thus p^2 is even, so p is even.

Let $p = 2k$.

Substitute:

$$(2k)^2 = 2q^2$$

$$4k^2 = 2q^2$$

$$q^2 = 2k^2$$

Thus q is also even.

If both p and q are even, they have a common factor 2, which contradicts the assumption that p and q are coprime.

Therefore, the assumption is false.

$$\sqrt{2} \text{ is irrational.}$$

2 . Differentiate between predicate and propositional logic, and write De Morgan's laws for both.
Found in Dec 2022 (1 a), Dec 2024 (4 b), June 2024 (1 b)

Answer : Proposition : A proposition is a declarative statement that is either true or false, but not both.

Example: "2 + 3 = 5".

Predicate : A predicate is a statement containing variables which becomes a proposition when values are assigned to the variables.
Example: P(x): "x > 5".

De Morgan's Laws for Propositions:

- $\neg(P \wedge Q) = (\neg P \vee \neg Q)$
- $\neg(P \vee Q) = (\neg P \wedge \neg Q)$

De Morgan's Laws for Predicates:

- $\neg(\forall x\, P(x)) = \exists x\, \neg P(x)$
- $\neg(\exists x\, P(x)) = \forall x\, \neg P(x)$

3 . Differentiate between Turing Acceptable Language and Turing Decidable Language.

Found in June 2023 (5 b), June 2024 (1 h), Dec 2024 (2 c)

Answer : Turing Acceptable Language

- A language accepted by a Turing Machine.
- Machine halts and accepts strings in the language.
- For strings not in the language, it may reject or loop forever.

Turing Decidable Language

- A language decided by a Turing Machine.
- Machine always halts for every input.
- It accepts strings in the language and rejects strings not in the language.

4 . Briefly discuss or write short notes on the Halting problem.

Found in Dec 2022 (4 b), June 2024 (3 c ii), Dec 2024 (5 c ii)

Answer : The Halting Problem is the problem of determining whether a given program will finish running or continue forever for a given input. It is a central topic in Computability Theory and helps us understand the limits of what computers can and cannot do.

In computability theory, it states that there is no general algorithm that can determine for every program and input whether the program will halt or run indefinitely. This means we cannot design a universal method that always predicts the behavior of every possible program correctly, no matter how complex it is.

Alan Turing proved that the Halting Problem is undecidable in 1936. He showed that no Turing Machine can solve this problem for all possible inputs. His proof uses a contradiction approach, where he assumes that such a solution exists and then constructs a special program that causes a contradiction, proving that the ass

5 . Write short notes on the Undecidable problem.

Found in June 2024 (3 c i), Dec 2024 (5 c i)

Answer : An Undecidable Problem is a type of problem in Computability Theory for which no algorithm exists that can always provide a correct “yes” or “no” answer for every possible input. In other words, it is impossible to design a universal procedure that solves the problem in all cases.

The key idea behind undecidable problems is that they go beyond the computational power of machines. Even the theoretical model of computation, known as the Turing Machine, cannot solve such problems for all inputs. This means there is no program or algorithm that can be written to handle every instance of the problem correctly.

One important characteristic of undecidable problems is that they lack a general computational procedure. While some specific cases of the problem may be solvable, there is no single method that works universally. Another feature is that these problems often involve self-reference, infinite [illegible] them impossible.

6 . Write and prove the Handshaking theorem or explain it with a suitable example.

Found in Dec 2022 (2 c), Dec 2023 (1 j), Dec 2024 (1 g)

Answer : The Stirling number of the second kind S(n,k) represents the number of ways to partition a set of n elements into k non-empty subsets.

Formula:

$S(n,k)=kS(n-1,k)+S(n-1,k-1)$

Calculate S(3,2)

Partitions of {1,2,3} into 2 subsets:

{1}{2,3}

{2}{1,3}

{3}{1,2}

S(3,2)=3

Calculate S(4,2)

Using formula : S(4,2) = 2S(3,2)+S(3,1) =2(3)+1 =7

Thus,

S(3,2)=3

S(4,2)=

MCS-212 Most Repeated Questions

7 . Differentiate between Deterministic Finite Automata (DFA) and Non-deterministic Finite Automata (NDFA).

Found in Dec 2021 (1 e), Dec 2022 (4 a i), Dec 2024 (5 a i)

Answer : The differences b/w DFA and NFA are:

- Number of Transitions
  - DFA: For each state and each input symbol there is exactly one transition.
  - NFA: For a state and input symbol there may be zero, one, or multiple transitions.
- Computation Path
  - DFA: Only one computation path exists for a given input string.
  - NFA: There may be multiple possible paths for a given input string.
- Transition Function
  - DFA: Transition function gives one next state.
  - NFA: Transition function gives a set of possible next states.
- Implementation
  - DFA: Easier to implement in practical systems.
  - NFA: Easier to design but usually converted into

8 . Compare or differentiate between Moore machines and Mealy machines.

Found in Dec 2022 (4 a ii), Dec 2023 (3 b), June 2025 (5 a)

Answer :

Feature	Moore Machine
Output dependency	Depends only on the current state
Output location	Output is associated with states
Output change	Output changes only when state changes
Number of states	Usually more states
Stability	More stable

MCS-212 Most Repeated Questions

9 . What is Kleene closure and how do you find it for a given set of alphabets?

Found in June 2023 (1 d), Dec 2023 (1 f), Dec 2024 (2 a, 5 a ii), June 2025 (2 a)

Answer : Kleene Closure: The Kleene closure of a set Σ is the set of all possible strings of finite length that can be formed using the symbols of Σ, including the empty string ϵ\epsilonϵ. It is an important concept in Formal Language Theory and is widely used in automata and language design.

It is denoted by Σ∗, where the “∗” symbol represents repetition of elements any number of times (including zero times). The inclusion of zero repetitions is what ensures that the empty string ϵ is always part of the Kleene closure.

Given : Σ={0,1}

Then, Σ∗={ϵ,0,1,00,01,10,11,000,001,010,011,…}

So, it contains all binary strings of any possible length, including the empty string ϵ\epsilonϵ. The strings can be of length

The Klee languages and regular expressions.

10 . What is a bipartite graph, and can you explain it with examples or applications?

Found in Dec 2021 (1 j), June 2022 (5 c), June 2023 (2 d), Dec 2023 (5 i), Dec 2024 (2 d)

Answer : Bipartite Graph : A bipartite graph is a type of graph in Graph Theory in which the set of vertices can be divided into two disjoint sets such that no two vertices within the same set are connected by an edge. In other words, every edge connects a vertex from one set to a vertex in the other set.

Formally, a graph G=(V,E) is bipartite if the vertex set VVV can be split into two subsets V1 and V2 such that:

- $V1 \cap V2 = \emptyset$
- $V1 \cup V2 = V$
- Every edge connects a vertex in V1 to a vertex in V2

Example: Cycle Graph C6:

Consider the cycle graph C6, which has 6 vertices and forms a closed loop.

Vertices:

V={v1,v

Edges:

(v1,v2),(v2,v3),(v3,v4),(v4,v5),(v5,v6),(v6,v1)