# Applied Computational Intelligence: MCQs

## Task 01 Topics

### NP vs. P

1. Which of the following statements is true?  
 A. Every problem in NP can be solved in polynomial time.  
 B. **If a problem is NP-complete, it is at least as hard as any problem in NP.**  
 C. P contains all problems for which no efficient algorithm is known.  
 D. NP ⊆ P unless P ≠ NP.

2. A problem is said to be in class P if:  
 A. There exists a nondeterministic polynomial-time algorithm that solves it.  
 B. Every instance can be verified in polynomial time.  
 C. **There exists a deterministic polynomial-time algorithm that solves it.**  
 D. It can be reduced in polynomial time to an NP-complete problem.

3. Which of these is not known to be NP-complete?  
 A. SAT (Boolean satisfiability)  
 B. 3-Coloring of a graph  
 C. **Minimum Spanning Tree**  
 D. Hamiltonian Cycle

### Linear Programming

4. Which of these is not required when formulating a linear-programming problem?  
 A. Decision variables  
 B. An objective function that is linear in the variables  
 C. **Nonnegativity constraints on all variables** D. A set of linear equality or inequality constraints

5. In the simplex method, a basic feasible solution corresponds to:  
 A. Any point satisfying all constraints  
 B. **A corner (vertex) of the feasible polytope**  
 C. The global maximum of the objective  
 D. An interior point with strictly positive variables

6. Which of the following is a dual of the LP:  
 max 3x1 + 2x2, s.t. x1 + 2x2 ≤ 4, 4x1 + x2 ≤ 6, xi ≥ 0?  
 A. **min 4y1 + 6y2, y1 + 4y2 ≥ 3, 2y1 + y2 ≥ 2, yi ≥ 0**  
 B. min 4y1 + 6y2, y1 + 4y2 ≤ 3, 2y1 + y2 ≤ 2, yi ≥ 0  
 C. min 3y1 + 2y2, y1 + 4y2 ≥ 4, 2y1 + y2 ≥ 6, yi ≥ 0  
 D. min 4y1 + 6y2, y1 + 4y2 ≥ 3, 2y1 + y2 ≥ 2, yi free

7. Which situation is least suited to be modeled by LP?  
 A. Blending different oils subject to quality constraints  
 B. Scheduling tasks with start-to-finish precedence constraints  
 C. Allocating bandwidth among users to maximize throughput  
 D. **Solving Sudoku puzzles (fill digits 1–9 so each row/column/block has all)**

### Applications of LP vs. Regression

8. In which scenario would you choose linear regression over linear programming?  
 A. Allocating production resources to minimize cost under capacity limits  
 B. **Predicting tomorrow’s stock price based on past data**  
 C. Scheduling airline crews to cover all flights at minimum cost  
 D. Blending fuels to meet octane and emission standards

9. You have cost data and want to estimate a continuous relationship between two variables—your best choice is:  
 A. Integer programming  
 B. **Linear regression**  
 C. Nonlinear programming  
 D. Linear programming

10. Which regression technique can be cast as a linear-programming problem?  
 A. Ordinary least squares  
 B. Ridge regression  
 C. **Lasso regression**  
 D. Polynomial regression

11. Which of these regression losses is not piecewise-linear and thus not directly LP-formulable?  
 A. L1 (absolute deviation)  
 B. **Huber loss**  
 C. Quantile loss  
 D. Sum of absolute errors

### Machine Learning Fundamentals

12. Which of the following is not a standard component of supervised learning?  
 A. A dataset with input-output pairs  
 B. A mechanism to measure generalization error  
 C. **A feedback loop that adjusts inputs to maximize reward**  
 D. A model hypothesis class

13. Overfitting occurs when a model:  
 A. Has too few parameters for the data  
 B. Performs well on unseen data but poorly on training data  
 C. **Learns noise instead of the underlying pattern**  
 D. Has a convex loss function

14. Which technique helps prevent overfitting?  
 A. Increasing model complexity  
 B. **Early stopping on a validation set** C. Training longer on the same data  
 D. Removing cross-validation

## Task 02 Topics

### Machine Learning Pipeline

15. What is the correct order of these steps in a typical ML pipeline?  
 1. Model creation  
 2. Data acquisition  
 3. Data splitting  
 4. Data cleaning and transformation  
 5. Model evaluation  
 A. **2 → 4 → 3 → 1 → 5**  
 B. 2 → 3 → 4 → 1 → 5  
 C. 2 → 4 → 1 → 3 → 5  
 D. 4 → 2 → 3 → 1 → 5

16. Which step comes immediately before model creation?  
 A. Data acquisition  
 B. Model evaluation  
 C. **Data splitting**  
 D. Feature selection (if treated separately)

17. During data splitting, a common ratio for train:test is:  
 A. **90:10**  
 B. 50:50  
 C. 10:90  
 D. 100:0

18. Cross-validation is performed to:  
 A. Acquire more data from new sources  
 B. **Evaluate model stability on unseen subsets**  
 C. Transform categorical variables into numeric  
 D. Clean missing data

### Data Categorisation

19. Which type of variable is ordinal?  
 A. Eye color (blue, green, brown)  
 B. Number of children in a family  
 C. Customer satisfaction rating (1 = poor … 5 = excellent)  
 D. **Customer ID**

20. Which of these is a discrete numerical variable?  
 A. Time to complete a task (in seconds)  
 B. **Number of cars sold per month**  
 C. Temperature in Kelvin  
 D. Air quality index (continuous scale)

21. A variable that carries no predictive value and can safely be dropped is:  
 A. Zip code (with thousands of unique values)  
 B. Age (in years)  
 C. Gender (male/female)  
 D. **Completely random UUID assigned to each record**

22. Which variable type can take any real value in an interval?  
 A. Categorical  
 B. Ordinal  
 C. **Continuous**  
 D. Discrete

23. In a classification task to predict credit default, the target is:  
 A. Customer income  
 B. **Default flag (yes/no)**  
 C. Number of credit inquiries  
 D. Account opening date

24. A predictor is:  
 A. The value the model aims to output  
 B. **Any feature that helps explain variation in the target**  
 C. Always continuous  
 D. Synonymous with an irrelevant feature