2. **AHP – Analytic Hierarchy Process**

**Exercise 2-1**

1. **What does AHP mean?**
   - a) Analytic Hierarchy Program
   - b) **Analytic Hierarchy Process**
   - c) Analytic Hierarchical Programming
   - d) Analytical Hierarchy Partitioning

2. **Which is the typical Saaty’s scale?**
   - a) A 1-5 point scale
   - b) **A 1-9 point scale**
   - c) A 1-10 point scale
   - d) A 1-100 point scale

3. **What is the main purpose of AHP?**
   - a) AHP prioritizes alternatives based on criteria and constraints
   - b) AHP assigns goals to alternatives
   - c) **AHP prioritizes alternatives based on criteria**
   - d) AHP assign criteria to alternatives

4. **Pairwise comparisons in AHP are based on which type of scale?**
   - a) **Ratio scale**
   - b) Interval scale
   - c) Ordinal scale
   - d) Nominal scale

5. **How many pairwise comparisons are required to rank five criteria**
   - a) 25
   - b) 20
   - c) 15
   - d) 10
3. ANP – Analytic Network Process

Exercise 3-1

1. What does ANP stand for?
   a) Analytic Neural Program
   b) Analytic Neural Process
   c) Analytic Network Process
   d) Analytical Network Program

2. What is an inner dependency?
   a) A correlation between two clusters
   b) A correlation between decision-makers
   c) A correlation between alternatives and criteria
   d) A correlation of nodes in the same cluster

3. What is ‘feedback’ in an ANP structure?
   a) A correlation between two clusters
   b) A sensitivity analysis
   c) An inner dependency
   d) A master-slave dependency

4. Which of the following statements is false?
   a) ANP is more precise than AHP
   b) ANP requires more pairwise comparisons than AHP
   c) ANP is an extension of AHP
   d) ANP, unlike AHP, uses direct evaluations

5. In ANP, a goal node is not necessary when...
   a) Criteria depend on alternatives
   b) Alternatives depend on criteria
   c) A goal is unclear
   d) There is an inner dependency
4. MAUT
Exercise 4-1

1. What is MAUT the acronym of?
   a) Measuring Awareness by a Utilisation Technique
   b) Measuring Assurance by a Utility Technique
   c) Measuring Attractiveness by Utility Technique
   d) Multi Attribute Utility Theory

2. Which of the following statements is correct?
   a) MAUT leads to a partial order of the alternatives.
   b) A limited number of different marginal utility functions exist.
   c) The utility scores lead to a complete order.
   d) The utility function is always a sum of marginal utility functions.

3. Which of the following statements is incorrect?
   a) The additive model is the most used aggregation model of MAUT.
   b) The weighted sum is a particular MAUT model.
   c) The normalisation of the performances of the alternatives can be omitted in MAUT if the marginal utility functions are defined accordingly.
   d) The MAUT method compare the alternatives pairwise in order to attribute them a score.

4. Decreasing utility functions are generally for:
   a) Criteria to be minimised
   b) Criteria to be maximised
   c) Criteria to be minimised or maximised
   d) Only increasing criteria exists

5. What does not exist in MAUT
   a) Preferences
   b) Indifferences
   c) Incomparability
   d) Sensitivity analysis
5. **MacBeth**

**Exercise 5.1**

1. What is MACBETH the acronym of?
   a) Measuring Awareness by a Consistent Based Evaluation Technique
   b) Measuring Assurance by a Cooperative Based Evaluation Technique
   c) Measuring Attention by a Coherent Based Evaluation Technique
   d) Measuring Attractiveness by a Categorical Based Evaluation Technique

2. What type of scale is used in MACBETH for expressing the comparisons?
   a) A ratio scale
   b) A nominal scale
   c) An interval scale
   d) A categorical scale

3. How many semantic categories are in MACBETH?
   a) 6
   b) 7
   c) 8
   d) 9

4. If the judgments are A<B and B-C >A-C, are they?
   a) Consistent
   b) Incoherent
   c) Semantic inconsistent
   d) None of the above statements

5. If the judgments are: A is weakly better than B, B is strongly better than C and A is moderately better than C, are they?
   a) Consistent
   b) Incoherent
   c) Semantic inconsistent
   d) None of the above
6. PROMETHEE
   Exercise 6-1

1. What does PROMETHEE mean?
   a) Positive Organisation METHod with Enriched Evaluation
   b) Preference Organisation METHod for Enriched Evaluation
   c) PROfessional METHod for Easy Evaluation
   d) PROactive MEasurement THEory Evaluation

2. Which statement is INCORRECT?
   a) Promethee can be used in a wide range of applications
   b) Every decision-maker will find the same ranking
   c) The Promethee method requires a lot of input parameters
   d) Results can be explained

3. What is the main purpose of Promethee?
   a) Promethee prioritizes actions based on criteria and constraints
   b) Promethee assigns goals to actions
   c) Promethee ranks actions based on criteria
   d) Promethee assigns criteria to alternatives

4. Pairwise comparisons are based on which type of scale?
   a) Ratio scale
   b) Interval scale
   c) Ordinal scale
   d) Nominal scale

5. How many input parameters does a decision maker need to specify for a criterion (supposing he has chosen a linear preference function)?
   a) 5
   b) 4
   c) 3
   d) 2
7. ELECTRE

Exercise 7.1

1. What does ELECTRE stand for?
   a) Elimination Et Choix Traduisant la Réalité
   b) ELicit, Evaluate Criteria Through References
   c) ELECitation and TRained Evaluation
   d) Evidence Limitée Et Confidence Transcripte de la Réalité

2. Which statement is INCORRECT?
   a) Electre can be used in a wide range of applications
   b) Every decision-maker will find the same ranking
   c) The Electre method requires a lot of input parameters
   d) Results can be explained

3. What is the main purpose of Electre III?
   a) Electre III prioritises alternatives based on criteria and constraints
   b) Electre III assigns goals to alternatives
   c) Electre III ranks alternatives based on criteria
   d) Electre III sorts alternatives

4. On what scale are pairwise comparisons based?
   a) Ratio scale
   b) Interval scale
   c) Ordinal scale
   d) Nominal scale

5. How many input parameters does a decision maker need to specify for each criterion in ELECTRE III?
   a) 5
   b) 4
   c) 3
   d) 2
9. Goal programming

Exercise 9.1

1. How many deviational variables are in the objective function of goal programming?
   a) Equivalent to the number of goals
   b) Twice the number of goals
   c) Equivalent to the number of soft and hard constraints
   d) Twice the number of soft and hard constraints

2. What is a soft constraint?
   a) An inequality
   b) A constraint with a threshold indicating unfeasible solutions.
   c) A goal
   d) A constraint that is not needed in the modelling of the problem

3. Which statement is incorrect?
   a) All deviational variables should be included in the equation
   b) A rigid constraint is not a goal
   c) Several solutions may exist
   d) All goals are always satisfied

4. What type of problems can goal programming solve?
   a) Problems with a discrete solution space
   b) Problems with continuous solution space
   c) Problems with a binary solution space
   d) Sorting problems

5. Goal programming is a generalisation of which method?
   a) MacBeth
   b) Linear programming
   c) TOPSIS
   d) DEA
10. DEA - Data Envelopment Analysis
Exercise 100-1

1. What is the main purpose of DEA?
   a) DEA measures DMUs’ effectiveness
   b) **DEA measures DMUs’ efficiency**
   c) DEA measures DMUs’ profit
   d) DEA measures DMUs’ productivity

2. A dataset includes information about input quantity, input cost and output quantity. Which type of efficiency cannot be measured?
   a) Technical efficiency
   b) Cost efficiency
   c) **Revenue efficiency**
   d) Scale efficiency

3. ‘Pure’ technical efficiency reflects:
   a) A global measure of DMU performance
   b) The efficiency of a DMU operating at an incorrect scale
   c) A measure of profit efficiency
   d) **The efficiency of a poorly managed DMU**

4. DMU A is inefficient. Who is its peer(s)?
   a) One or several DMUs whose efficiency scores are worse than DMU A’s efficiency
   b) One or several DMUs whose efficiency scores are better than DMU A’s efficiency, but which are not located on the efficiency frontier
   c) Any DMU located on the efficiency frontier
   d) **One or several specific DMUs (i.e. a subgroup of efficient DMUs) located on the efficiency frontier**

5. A DMU faces diseconomies of scale. How can the management team improve its efficiency?
   a) By merging with another DMU
   b) By producing more output
   c) **By producing less output**
   d) By producing the same amount of output
6. A manager plans to measure efficiency using three inputs and two outputs. What is the minimum number of DMUs that should be included in the dataset?
   a) 10
   b) 6
   c) 15
   d) It does not matter