Analytical Dichotomous Rubric for Smart Maintenance Competency Assessment

Scoring Rules

Each competency consists of five independent indicators.
Each indicator is scored dichotomously:
1 = Criterion met.
0 = Criterion not met.
Maximum score per competency: **5 points.**
Maximum overall score: **45 points.**

Competency 1. Vibration Interpretation

	Description	Score (0 or 1)
1	Correctly identifies the rotational speed of the equipment.	
2	Identifies predominant frequencies in the vibration spectrum.	
3	Recognizes harmonics or characteristic frequencies.	
4	Relates the observed frequencies to a potential failure condition.	
5	Proposes a technically sound maintenance action.	
	Competency score (0–5):	

Competency 2. Thermographic Interpretation

	Description	Score (0 or 1)
1	Correctly identifies the areas with the highest temperatures.	
2	Detects relevant thermal anomalies.	
3	Appropriately interprets the observed thermal gradients.	
4	Relates the thermal distribution to potential failure mechanisms.	
5	Proposes appropriate corrective or preventive actions.	
	Competency score (0–5):	

Competency 3. Acoustic Interpretation

	Description	Score (0 or 1)
1	Correctly identifies the reported sound level.	
2	Recognizes significant differences between operating conditions.	
3	Detects abnormal acoustic behavior.	
4	Relates the observed noise patterns to potential mechanical problems.	
5	Integrates acoustic information into maintenance decision-making.	
	Competency score (0–5):	

Competency 4. Failure Diagnosis

	Description	Score (0 or 1)
1	Correctly identifies the primary failure.	
2	Provides a technically justified diagnosis.	
3	Identifies potential causes of the problem.	
4	Identifies possible consequences of the failure.	
5	Proposes an appropriate intervention strategy.	
	Competency score (0–5):	

Competency 5. Information Integration

	Description	Score (0 or 1)
1	Uses vibration analysis data in the diagnostic process.	
2	Uses thermographic information in the diagnostic process.	
3	Uses acoustic monitoring data in the diagnostic process.	
4	Uses IoT-based monitoring data in the diagnostic process.	
5	Integrates information from multiple techniques to provide an evidence-based diagnosis.	
	Competency score (0–5):	

Competency 6. Use of IoT Technologies

	Description	Score (0 or 1)
1	Correctly accesses the monitoring platform.	
2	Appropriately interprets the monitored variables.	
3	Identifies trends or changes in the monitored variables.	
4	Uses the information to evaluate operating conditions.	
5	Uses the data to support a technical decision.	
	Competency score (0–5):	

Competency 7. Critical Evaluation of Artificial Intelligence

	Description	Score (0 or 1)
1	Appropriately formulates the technical query to the AI system.	
2	Compares the AI-generated response with the experimental data.	
3	Identifies potential errors or limitations in the AI-generated response.	
4	Justifies the acceptance or rejection of the proposed diagnosis.	
5	Provides an independent conclusion supported by technical evidence.	
	Competency score (0–5):	

Competency 8. Technical Communication

	Description	Score (0 or 1)
1	Presents results in a clear and organized manner.	
2	Uses appropriate technical terminology.	
3	Supports statements with experimental evidence.	
4	Formulates conclusions consistent with the results.	
5	Proposes technically justified recommendations.	
	Competency score (0–5):	

Competency 9. Technological Adaptation and Autonomous Learning

	Description	Score (0 or 1)
1	Uses digital tools without requiring continuous assistance.	
2	Explores additional functionalities of the platforms used.	
3	Searches for complementary technical information when necessary.	
4	Integrates new tools into the problem-solving process.	
5	Demonstrates initiative in improving results.	
	Competency score (0–5):	

Total Score	
Competency Level	

GCIIM (%)	
Competency Level	

GCIIM (%)	Competency Level
0–59	Low
60–79	Moderate
80–100	High