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Training Program	:	**RAM AND LCC ANALYSIS FOR RAILWAYS**
Discipline	:	**RELIABILITY & MAINTENANCE ENGINEERING**
System	:	**RAILWAYS ASSETS (ROLLING STOCK, SIGNALLING, INFRASTRUCTURE, LOCOMOTIVE)**
Subsystem	:	**Railways assets (Pantograph, Bogie, Breaks, Train Control Management System (TCMS), Balise, Computer Based Interlock (CBI), Lineside Electronic Unit (LEU), Radio Block Centre (RBC), Locomotive Diesel Engine, others.)**
Training Focus	:	**RAM Concept, Modeling and analysis of system performance**
Lesson Code	:	**203**
Lesson Title	:	**Reliability, Availability and Maintainability Analysis**
Training Elements	:	Book: RAMS and LCC Engineering for Railway Industry: Analysis, Modelling and Optimization (Chapters 2 and 4) Reliability, Availability and Maintainability concepts. RAM methodology RBD and FTA model RAM simulation Critical analysis and bad actor's quantification Preventive Maintenance, Inspection and spare part performance effect Lifetime Data Analysis case study RAM case studies

Training Objectives:

- To understand and apply the Reliability concept as basic of equipment specification and asset performance Index.
- To understand and apply the Availability concept as basic of equipment specification and asset performance Index.
- To understand and apply the Maintainability concept as basic of equipment specification and asset performance Index.
- To understand and implement the RAM methodology applied to different asset life cycle phases.
- To understand how to organize and assess the historical failure and repair database.
- To understand how to use specialist opinion to predict Reliability and maintainability.
- To understand and apply the methods to define type Probability Density function (PDF) to predict PDF parameters, reliability, failure rate.
- To model the system and equipment in component level applying RBD and FTA.
- To understand the effect of preventive maintenance and inspection in equipment reliability and operational availability.
- To understand the effect of spare part in equipment and system operational availability.
- To understand the difference between RBD and FTA.
- To understand the pros and cons of each RAM simulation software
- To understand how to model complex systems.

Day 1:

Subject	Activity	Time	Resources
Module 1 - Welcome and Introduction of participants and trainer, scope of training.	Theoretical	30 min	Forms & PPT
Module 2 - Reliability, availability, maintainability concept	Theoretical	60 min	PPT
Module 3 - RAM methodology concept	Theoretical	30 min	PPT
Module 4 - Lifetime data analysis (Weibull Analysis)	Theoretical	60 min	PPT
Lunch Break: 12:30 – 14:00 hrs.			
Module 5 - Lifetime data analysis (Weibull Analysis) case studies	Theoretical	60 min	Software & PPT
Module 6 - RBD and FTA model	Theoretical	60 min	PPT
Module 7 - RBD and FTA case studies	Practical	60 min	Software

Day 2:

Subject	Activity	Time	Resources
Module 11 - RAM simulation	Theoretical	120 min	PPT
Module 12 - Preventive Maintenance Modeling	Theoretical	30 min	PPT
Module 13 - Inspection modeling	Theoretical	30 min	PPT
Module 14 - Spare part Modeling	Theoretical	30 min	PPT
Module 15 - LCC modeling	Theoretical	30 min	PPT
Module 16 - RAM critical equipment (bad actors)	Theoretical	60 min	PPT
Lunch Break: 12:30 – 14:00 hrs.			
Module 17 - RAM sensitivity Analysis	Theoretical	60 min	PPT
Module 18 - RAM modeling equipment level	Practical	60 min	Software
Module 19 RAM model System level	Practical	120 min	Software