MAINTENANCE ENGINEERING

UNIT-I PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING

CO1	Describe objectives and the basic principles in maintenance
CO2	Explain Maintenance Policies and Preventive Maintenance
CO3	Illustrate the various processes involved in condition monitoring
CO4	Explain the influence of failure analysis in basic machine elements
CO5	Explain the role of Repair Methods for Material.

- Basic Principles of maintenance planning
- Objectives and principles of planned maintenance activity
- Importance and benefits of sound Maintenance systems
- Reliability and Machine availability
- MTBF, MTTR and MWT
- Factors of availability
- Maintenance organization
- Maintenance economics.

Maintenance engineering : Maintenance engineering is the activity of applying engineering concepts to the optimization of equipment, procedure and departmental budgets to achieve better maintainability, reliability and availability of equipment.

Planning: Planning ensures the smooth operation of the system. Planning defines what is to be done and how it is to be done. It specifies the materials, tool, equipment and skills required to perform the work.

Main classification of planning in engineering system are as follows,

- 1. Long range planning
- 2. Short range planning
- 3. Planning for immediate activity

1.Long Range planning : For a period of five years at least. Involves capital budgeting, strategies and operational programmers.

2. Short range: up to one year. Made to achieve short term goals.

3. Immediate Activity Planning : it is done frequently whenever required.

Objectives of Planned Maintenance Activity

- To achieve minimum breakdown and to keep the plant in good working condition at the lowest possible cost.
- > To ensure the availability of machines and services in an optimum working condition.
- To keep machines and other facilities in a condition to be used to achieve the maximum profit without any interruption.
- \succ To keep the time schedule of delivery to customers.
- > To meet the availability requirements for critical equipment.
- > To keep the maintenance costs as low as possible for non-critical equipment.
- > To control the effective and trained supervision.
- > To meet the quality requirements of the product.
- > To increase the profits of production systems.

Principles of Maintenance :They are followed in a system to guide the staff to work efficiently and effectively to achieve the overall objectives of the maintenance system,

Main areas of work governed by this principles are ✓ Plant management in Maintenance work ✓ Production and maintenance objectives Establishment of work order and recording system ✓ Information based Decision making \checkmark Adherence to planned maintenance strategy . ✓ Manpower for Maintenance ✓ Planning for maintenance functions ✓ Role of Spare parts \checkmark Training.

SOUND MAINTENANCE SYSTEM

The following are the benefits of sound maintenance management system

- \checkmark Minimization of down time
- ✓ Improvement in availability of system
- ✓ Extended life of equipment
- $\checkmark\,$ Safety and smooth operation of the process
- \checkmark Providing adequate back up supply
- \checkmark Minimization of normal expected wear and tear of equipment
- \checkmark Safety of the personal involved in the organization
- ✓ Increasing the reliability of the system
- ✓ Providing a proper working environment
- ✓ Cost effective maintenance boosts the profit of the production system.

Reliability: Reliability is the probability that a component/system when operating under given condition will perform its intended functions adequately fo a specified period of time.



Equipment lifecycle: Reliability engineering is dependability in the life cycle management of product. The failure pattern of equipment over its life cycle can be represented as *bath-tub* curve.



Mean Time To Failure(MTTF): Mean Time To Failure (MTTF) is a very basic measure of reliability used for non-repairable systems. It represents the length of time that an item is expected to last in operation until it fails.



for repairable systems, but it does not take into account units that are shut





Mean Time To Repair (MTTR): It refers to the amount of time required to repair a system an restore it to full functionality. The MTTR clock starts ticking when the repairs start and it goes o until operations are restored. This includes repair time, testing period, and return to the norma operating condition.



General Organization Structure of Maintenance Department



Maintenanc economics: Lifeeost cycle (LCCA) tosol to deternainedysithe most costoption among differenteffeotivpeeting alternatives to purchase, own, operate, maintain and, finally, dispose of an object or process, when each is equally appropriate to be implemented on technical grounds

Estimation of economic life of equipment its depends on the maintenance and repair cost, availability and operational efficiency.



Reliability costs are the business costs of unreliable systems.

Maintenance costs are the cost of doing maintenance; be that reactive or preventive maintenance.



Reliability