

MODULE : O&M 5

OPERATION AND MAINTENANCE OF RELAYS AND PROTECTION SYSTEMS

COURSE DESCRIPTION:

Introduction

Introduction to Protective Relays, Importance of Selection of Relays, Correct Relay Settings and Co-ordination.

Types of Relays

Non-directional and directional over current relays, voltage relays, frequency relays, power relays, impedance relays, instantaneous over current relays.

Application of Various types of IDMT Relays

Types of IDMT over current relays - Normal Inverse, Extremely Inverse, Very Inverse, Long Time Inverse.

NEMA device numbers

NEMA device numbers for various function protection and control relays.

Stages in Fault Clearance

Devices for protection system. Requirement for successful fault clearance.

Primary and Backup Protection

Definition of primary protection and backup protection. Examples, Zones of protections.

Need for Co-ordination of over current relays

Why co-ordination is required. Discrimination by current, discrimination by time and discrimination by both time and current. Examples of each type.

Protection of Transformer

Recommended protection for delta-star transformer of various ratings. Recommended protection for star-star transformer.

Transformer differential protection, transformer restricted earth fault protection.

Protection of Rectifiers

Typical protection schemes for rectifiers

Protection of motors

LT motor protection : Fuse and relay co-ordination, selection of correct type of relay.

HT motor protection : Thermal protection, stalling protection, unbalance protection, short circuit phase and ground protection.

Protection of feeders

Pilot wire protection, Requirements of pilot wire protection.

AC connection diagram of over current relays

Schemes for three over current and one earth fault, two over current and earth fault. Residual / CBCT connection of earth fault relays.

Typical DC connection diagram

How to read schematic diagrams, cross references on drawings.

Understanding typical protection schemes

Power circuit, control circuit, reading of drawings.

Importance of maintenance of DC system

DC control supply and its importance.

Auxilliary Power Supply

Universal voltage relays, relays with external droppers resistor.

Introduction and Application of current transformer for protection relay

Metering class CT, general purpose protection class CT, special purpose protection class CT. Instruments safety factor, knee point voltage, excitation current, accuracy limit factor, burden of CTs.

CT Performance and its influence of Relay Operation

Selection of CT specification.