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PS5006 DESIGN OF SUBSTATIONS

DETAILED SYLLABUS

OBJECTIVES

- To provide in-depth knowledge on design criteria of Air Insulated Substation (AIS) and Gas Insulated Substation (GIS).
- To study the substation insulation co-ordination and protection scheme.
- To study the source and effect of fast transients in AIS and GIS.

UNIT I INTRODUCTION TO AIS AND GIS

Introduction – characteristics – comparison of Air Insulated Substation (AIS) and Gas Insulated Substation (GIS) – main features of substations, Environmental considerations, Planning and installation- GIB / GIL

UNIT II MAJOR EQUIPMENT AND LAYOUT OF AIS AND GIS

Major equipment – design features – equipment specification, types of electrical stresses, mechanical aspects of substation design- substation switching schemes- single feeder circuits; single or main bus and sectionalized single bus- double main bus-main and transfer bus- main, reserve and transfer bus- breaker-and-a- half scheme-ring bus

UNIT III INSULATION COORDINATION OF AIS AND GIS

Introduction – stress at the equipment – insulation strength and its selection – standard BILs– Application of simplified method – Comparison with IEEE and IEC guides.

UNIT IV GROUNDING AND SHIELDING

Definitions – soil resistivity measurement – ground fault currents – ground conductor – design of substation grounding system – shielding of substations – Shielding by wires and masts.

UNIT V FAST TRANSIENTS PHENOMENON IN AIS AND GIS

Introduction – Disconnector switching in relation to very fast transients – origin of VFTO – propagation and mechanism of VFTO – VFTO characteristics – Effects of VFTO.

REFERENCES

1. Andrew R. Hileman, “Insulation coordination for power systems”, Taylor and Francis, 1999.
2. M.S. Naidu, “Gas Insulation Substations”, I.K. International Publishing House Private Limited, 2008.

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5. Pritindra Chowdhuri, “Electromagnetic transients in power systems”, PHI Learning Private Limited, New Delhi, Second edition, 2004.
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7. AIEE Committee Report, “Substation One-line Diagrams,” AIEE Trans. On Power Apparatus and Systems, August 1953.
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