

33073 ELECTRICAL MACHINE DESIGN

DETAILED SYLLABUS

OBJECTIVES

To understand

- Static and Rotating Electrical Machine specifications, materials, losses and effects of temperature rise.
- Magnetic force, magnetic force gap, teeth and leakage flux in static and rotating electrical machines.
- Designing of single phase, three phase transformer, core and coil.
- Designing of dc machines.
- Designing of 3phase induction motor and 3phase synchronous machines.

UNIT- I ELECTRICAL MACHINE DESIGN- BASIC CONSIDERATION

Design definition – Design consideration – limitation – constructional elements of Transformers and rotating machines – constructional materials of electrical machines – conducting magnetic and insulating materials standard specification – general design process – main dimensions of rotating machines – electrical and magnetic losses – temperature – rise – class of duty – limits of temperature rise.

UNIT- II MAGNETIC CIRCUIT CALCULATIONS

Magnetic circuits of DC machines, round rotation AC machines, salient poles AC machines and Transformer - Specific magnetic and electrical loading – Factor influencing the specific and magnetic loading – Magnetic leakages – magnetizing curves – calculation of magnetizing force for the air gap of rotating machines and for teeth – leakage flux – leakage reactance – armature slot leakage reactance

UNIT- III DESIGN OF TRANSFORMER

Important considerations – core and shell types – distribution transformers and power transformers – core section – clearance – yoke section – main dimension – single phase core type transformers – three phase core type transformer – output coefficient - voltage per turn – specific magnetic and electric loading of transformer – Winding design – cross over, helix, disc helix.

UNIT- IV DESIGN OF DC MACHINES

Important design consideration – number of poles – advantages of large number of poles - air gap – armature slot – current density – field system – commutator – design of large dc motor. Specific magnetic and electric loading of dc machines.

UNIT- V DESIGN OF AC MACHINES

AC machine design consideration – power equation – separation of diameter and length – problems. Three phase induction motor – important design consideration – standard frames and stampings – gap length – flux density – current density – power factor – efficiency – slot combination – winding - design of 3 phase induction motors. Three phase 16 15 Curriculum Development Centre, DOTE. Page 143 synchronous machines – important design consideration – radial gap length – stator slot – stator coil – rotor construction – design of 3 phase synchronous machines.