EE6604 DESIGN OF ELECTRICAL MACHINES

DETAILED SYLLABUS

OBJECTIVES:

- To study mmf calculation and thermal rating of various types of electrical machines.
- To design armature and field systems for D.C. machines.
- To design core, yoke, windings and cooling systems of transformers.
- To design stator and rotor of induction machines.
- To design stator and rotor of synchronous machines and study their thermal behaviour.

UNIT I INTRODUCTION

Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings - Thermal considerations - Heat flow – Temperature rise and Insulating Materials - Rating of machines – Standard specifications.

UNIT II DC MACHINES

Output Equations – Main Dimensions – Choice of Specific Electric and Magnetic Loading – Maganetic Circuits Calculations - Carter's Coefficient - Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes – performance prediction using design values.

UNIT III TRANSFORMERS

Output Equations – Main Dimensions - kVA output for single and three phase transformers – Window space factor – Design of core and winding – Overall dimensions – Operating characteristics – No load current – Temperature rise in Transformers – Design of Tank - Methods of cooling of Transformers.

UNIT IV INDUCTION MOTORS

Output equation of Induction motor – Main dimensions – Choice of Average flux density – Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor – Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current - Short circuit current – Operating characteristics- Losses and Efficiency.

UNIT V SYNCHRONOUS MACHINES

Output equations – choice of Electrical and Magnetic Loading – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

TEXT BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.

2. M. V. Deshpande "Design and Testing of Electrical Machine Design" Wheeler Publications, 2010.

REFERENCES:

1. A. Shanmuga Sundaram, G. Gangadharan, R. Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint, 2007.

2. R. K. Agarwal "Principles of Electrical Machine Design" Esskay Publications, Delhi, 2002.

3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.