

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, V-Semester

EX501 Electrical Machine-II

Unit-I

D.C. Machine-I

Basic construction of DC machines; types of DC machines and method of excitation; lap and wave windings; Emf equation; armature reaction and methods of limiting armature reaction; Commutation process and methods for improving commutation; Basic performance of DC generators and their performance characteristics; Metadyne and Amplidyne; permanent magnet DC motors; Brush less dc motors.

Unit-II

D.C. Machine-II

Basic operation of DC motors; Torque equation; Operating characteristics of DC motors, Starting of DC motors- 2point, 3 point and 4 point starters; speed control of DC motors; losses and efficiency of DC machines; testing of DC machines, direct testing, Swinburne's test and Hopkinson's test. Application of DC machines.

Unit-III

Synchronous Machine-I

Construction; types of prime movers; excitation system including brushless excitation; polyphase distributive winding, integral slot and fractional slot windings; emf equation, generation of harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, mmf, zpf and new A.S.A method.

Unit-IV

Synchronous Machine-II

Salient pole machines; two reaction theory equivalent circuit model and phasor diagram; determination of X_d and X_q by slip test; SCR and its significance; regulation of salient pole alternator, power angle equation and characteristics; synchronizing of alternator with infinite busbar,; parallel operation and load sharing; synchronizing current, synchronizing power and synchronising torque coefficient; synchro scopes and phase sequence indicator; effect of varying excitation and mechanical torque.

Unit-V

Synchronous machine-III

Synchronous motor operation, starting and stopping of synchronous motor, pull in torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, synchronous motors as power factor correcting device, super synchronous and sub synchronous motors, hunting and damper winding efficiency and losses. Analysis of short circuit oscillogram, determination of various transient, sub transient and steady reactances and time constants, expression of transient and sub transient reactances in terms of self and mutual inductances of various winding, short circuit current, equivalent circuit. Single phase synchronous motors- hysteresis motor, reluctance motor. Repulsion motor, stepper motor, switched reluctance

REFERENCE BOOKS

1. M.G. Say, Performance & design of AC machines, CBS publishers & distributors, Delhi, 3rd edition
2. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition
3. P.S. Bhimbra, Electrical Machinery, Khanna Pub.
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5. Ashfaq Husain, Electric Machines, Dhanpat Rai, New Delhi
6. I.J. Nagrath & D.P. Kothari, Electric Machines, Tata McGraw Hill , New Delhi,
7. Syed A. Nasar, Electric Machines & Power Systems, Volume I , Tata McGraw Hill, New Delhi
8. M.G. Say, Performance & design of AC machines, CBS publishers & distributors, Delhi, 3rd edition
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16. A.E. Fitzgerald, C. Kingsley & S.D. Umans , Electric Machinery Tata McGraw Hill ,New Delhi ,5thedition

Experiment List

1. To plot magnetisation characteristic of a separately excited DC generator
2. To perform load test on DC generators.
3. To perform load test on DC series and shunt motor
4. To perform Swinburn's test on a DC machine and find out its efficiency under full load condition.
5. To conduct Hopkinson's test on a pair of DC shunt machine.
6. To perform OCC and SCC test on an alternator and determine its regulation.
7. To determine regulation of alternator using mmf and zpf methods.
8. To synchronise alternator with infinite bus bar.
9. To plot V and inverted V curves for a synchronous motor
10. To find X_d and X_q of salient pole synchronous machine by slip test.
11. To Determine negative sequence and zero sequence reactance of an alternator.
12. To determine subtransient direct axis and quadrature axis synchronous reactances of salient pole machine.