DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR

M SCHEME

III SEMESTER

2015 – 2016 onwards

ELECTRICAL MACHINES - I

CURRICULUM DEVELOPMENT CENTRE

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

M - SCHEME

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 33032

Semester : III Semester

Subject Title : **ELECTRICAL MACHINES - I**

TEACHING AND SCHEME OF EXAMINATION:

No. of weeks per Semester: 15 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ELECTRICAL MACHINES - I	5	75	25	75	100	3 hrs

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hours)
I	D C Generators	13
II	D C Motors	13
III	Single Phase Transformers	12
IV	Three Phase Transformers	13
V	Storage Batteries	12
	Revision and test	12
	Total	**75**

RATIONALE:

- This subject is classified under core technology group which intends to teach the facts, concepts, principles of electrical machines, such as DC generators, DC motors, single & three phase transformers and DC electrical source (battery).
- Student will be able to analyze the characteristics of DC generators and motors, Transformers, battery & Qualitative parameters of these static and dynamic machines. These machines are used in transmission, distribution and utilization systems.
- Knowledge gained by students will be helpful in study of technological subjects such as utilization of electrical energy, switchgear & protection, manufacturing processes & maintenance of electrical machines.

OBJECTIVES:

Students will be able to:

1. Know the constructional details & working principles of dc machines and transformers.
2. Evaluate the performance of dc generators, motors & transformers.
3. Decide the suitability of dc generator, motor & transformer for particular purpose.
4. Write the specifications of dc machines & transformers as per requirement.
5. Know the constructional details, working principle, testing and capacity of battery

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**D C GENERATORS** Review of electromagnetic induction – Faraday's laws – Fleming's right hand rule – Principle of operation of D.C. generators – Construction of D.C. generators – Field system– Types of armature windings – Principles of lap and wave windings – EMF equation – Types of D.C. generators – Building up of voltage of D.C. Shunt generators –– No load characteristics of Shunt generator – Determination of critical field resistance – Causes of failure to build-up voltage and remedy – Load characteristics of series and shunt generators – load characteristics of cumulatively and differentially compounded generators – Applications – Problems in above topics – armature reaction – methods of compensating armature reaction – process of commutation – sparking in commutators – methods of improving commutation.	13
II	**D C MOTORS** Principle of operation of D.C. Motors – Fleming's left hand rule – Construction – Back emf – Torque equation – Types of motors – Torque-current, Speed-current, Speed-Torque characteristics of different motors – Speed control of DC motors – Field control and armature control– necessity of Starters– 3 Point and 4 Point starters – losses in D.C. Machines – Testing of D.C. machines - Predetermination of efficiency of motor and generator by Swinburne's test – Problems in above topics – Applications of D.C. Motors.	12
III	**SINGLE PHASE TRANSFORMERS** Principle of operation – Constructional details of core, shell type transformers – coil assembly – EMF Equation – Voltage ratio – Transformer on No load – Transformer on load – Current ratio – Phasor diagram on no load and on load at different power factors – O.C. test, S.C. test – Determination of equivalent circuit constants– Determination of voltage regulation and efficiency – Condition for maximum efficiency – All day efficiency – Problems on the above topics - polarity test– Parallel operation of single phase transformers– Auto transformer – principle – saving of copper – applications.	14

IV	**THREE PHASE TRANSFORMERS** Three phase Transformer construction – Types of connections – Star-star, Star-Delta, Delta-Star, Delta-delta connections – Scott connection - V connection of transformer – Parallel operation of three phase transformers –grouping of transformers– Conditions – Phasing out test – Pairing of transformer - Load sharing of transformers with equal and unequal ratings –Cooling of transformers – Various cooling arrangements – Transformer accessories – conservator – breather – explosion vent – Bucholz relay–ON load and OFF load tap changer – Transformer oil tester – Acidity test -– Earthing – Measurement of earth resistance.	12
V	**STORAGE BATTERIES** Classification of cells –construction – chemical action and physical changes during charging , discharging - internal resistance and specific gravity of lead acid, nickel iron and nickel cadmium cells – indication of fully charged and discharged battery –defects and their remedies – capacity – methods of charging – maintenance – applications.	12

TEXT BOOK

SL.NO	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	A Text Book Of Electrical Technology Volume II	B.L. Theraja	S.Chand & Co.New Delhi
2	Electrical Technology	Edward Hughes	Addision – Wesley International Student Edition

REFERENCE BOOK

SL.NO.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1.	Elements Of Electrical Engineering	Maria Louis	Prentice - Hall Of India Pvt Ltd
2	Electrical Machines	Nagarath	TMH Publications
3	Electrical Machines	Bhattacharya	TMH Publications