DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

ELECTRICAL MACHINES - II

CURRICULUM DEVELOPMENT CENTRE

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

M - SCHEME

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 33041

Semester : IV Semester

Subject Title : **ELECTRICAL MACHINES - II**

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 - II	6	90	25	75	100	3 hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPIC	TIME (Hours)
I	Alternator principles and construction	16
II	Alternator performance and testing	16
III	Three phase induction motor	15
IV	A)Single phase induction motor B) Synchronous motor	16
V	A)Special ac machines B)Special dc machines	15
	Revision and test	12
	Total	**90**

RATIONALE

- This subject is classified under core technology group intended to teach students facts, concepts, Principles of electrical machines such as induction motor, alternator and synchronous motor.
- Student will be able to analyze the characteristics and qualitative parameters of these machines.
- These machines are widely used in industries and for generation of electricity.
- The knowledge gained by the student is useful in the study of technological subjects such as Utilization System, Manufacturing Processes and Testing and Maintenance of Electrical machines.
- The knowledge and skills obtained will be helpful in discharging technical functions such as Supervision, controlling and as R & D technician.

OBJECTIVES

The students should be able to

- Alternator Principle, Construction, Types, EMF Induced and cooling
- Performance of an Alternator, Testing, Characteristics, parallel operation, Load sharing etc.,
- 3-Φ Induction Motor, Principle, Construction, Types, Characteristics and Applications, starting Methods
- 1-Φ Motor types, Construction, Characteristics and Applications
  Synchronous Motor, Starting, Construction, Characteristics and Applications
- Special AC machines and DC machines Construction, Characteristics and Applications

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**ALTERNATOR PRINCIPLES AND CONSTRUCTION** Basic principle of alternators – Types of alternators – Stationary armature rotating field – advantages of rotating field – Construction details of alternator – Salient pole rotor – Cylindrical type rotor – Types of A.C. armature windings – Types of slots – Full pitch and short pitched windings – Phase spread angle and effect of distribution factor – pitch factor – relation between frequency, speed and number of poles – EMF equation – Problems – methods of obtaining sine wave – Critical speed of rotor – Ventilation of turbo alternators – advantages of hydrogen cooling and its precaution – excitation and exciters.	16
II	**ALTERNATOR PERFORMANCE AND TESTING** Load characteristics of alternators – reason for change in terminal voltage –Qualitative treatment of armature reaction for various power factor loads – effective resistance – leakage reactance – synchronous reactance, synchronous impedance – Voltage regulation – Determination of voltage regulation by synchronous impedance method (simple problems)- MMF method – potier method. Necessity and conditions for parallel operation of alternators – synchronizing by dark lamp method, bright lamp method ,dark - bright lamp method and synchroscope method– synchronizing current, synchronizing power and synchronizing torque – load sharing of alternators –infinite bus bar .	16

III	**THREE PHASE INDUCTION MOTOR** Rotating magnetic field – Principle of operation of three phase induction motors – slip and slip frequency – comparison between cage and slip ring induction motors –development of phasor diagram – expression for torque in synchronous watts – slip-torque characteristics – stable and unstable region – no load test and blocked rotor test – development of approximate equivalent circuit – problems on the above topics – simplified circle diagram – determination of maximum torque, slip (problems not required) – starting torque and starting current expression – relationship between starting torque and full load torque – speed control of induction motors. Starters of induction motors – direct on line starter and its merits for cage motors – star delta starter- auto transformer starter -rotor resistance starter – cogging –crawling in induction motor– double cage induction motor-induction generator.	15
IV	**A)SINGLE PHASE INDUCTION MOTOR** single phase induction motors – not self starting – methods of making itself starting – construction, working principle –phasor diagram-slip torque characteristics- split phase motor - capacitor motor - shaded pole motor - repulsion motor - universal motor – operation of three phase motor with single phase supply. **B) SYNCHRONOUS MOTOR** Principle of operation –not self starting – methods of starting–effects of excitation on armature current and power factor– 'V' curve and inverted 'V" curve of synchronous motor – the phenomenon of hunting and prevention of hunting by damper winding – comparison between synchronous motor and three phase induction motor -applications -problems on power factor improvement.	16
V	**A)SPECIAL AC MACHINES** Permanent magnet Synchronous motors – Construction and performance – Advantages – Applications –Synchros – Constructional features – Control Transmitter – Control receiver - Applications of synchros– A.C. Servo motors – Two phase A.C.	15

	Servo motor – Linear induction motor. **B)SPECIAL DC MACHINES** Permanent Magnet D.C. Motor – Construction–Working principle – Speed control – Advantages – Applications – Servo motors – D.C. Servomotors – Stepper motors – Variable reluctance stepper motor – Permanent magnet stepper motor.	

TEXT BOOK

S.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

S.NO.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1.	Performance And Design Of Ac machines	M.G.Say	Pitman Publishing Ltd
2.	Electrical Machines	Nagarath	TMH Publications
3.	Electrical Machines	Bhattacharya	TMH Publications