भाग 'स'
परीक्षा पाठ्यक्रम

SYLLABUS OF ASSISTANT ENGINEER CIVIL
PART-I

(A) Structural Analysis :

Principles of superposition : reciprocal Theorem unsymmetrical bending.

Determinate and indeterminate structures, simple and space frames, degrees of freedom, virtual work, energy theorem, deflection of trusses redundant frames, three moment equation slope deflection, moment distribution and kani's methods, column anology. Energy methods, Approximate methods of analysis of rigid frames.

Moving loads- Shearing force and Bending moment diagrams in fluence line for simple and continuous beams and frames;

Analysis of determinate and indeterminate arches; spandrel braced arch.

Matrix methods of analysis; stiffness and flexibility matrices. Elements of plastic analysis.

(B) Structural Design :

(i) Steel Design – Factors of safety and load factors; Design of tension, compressior and flexural members; built up beams and plate girders semi-rigid and rigid connections. Design of stanchions, slab and gussested bases; gentry girders; roof trusses; industrial and multi storied building; water tanks and towers. Plastic design of continuous frames and portals.

(ii) R.C.C. Design – Working stress and limit state methods of Design of slabs, rectangular T & L beams simply supported and continuous; column & footings isolated and combined, raft foundations over-head & underground water tanks, encased beams and columns.

Methods and systems of pre stressing anchorages, losses in pre stress; design of pre stressed beams.

(C) Construction, Planning and Management

Building estimates and specifications, valuation, contract conditions and agreement, construction scheduling, CPM and PERT methods.

(D) Environmental Engineering

Water quality criteria for various uses e.g. domestic & irrigational. Transmission of water. Unit processes and operations for water treatment sedimentation, coagulation & flocculation, filtration, slow & rapid sand, decao media filters, disinfection sofeting, removal of taste, odour and salanity.

Quantity and characteristic of domestic waste water sewerage system and sewage pumps, unit processes and operation for domestic waste water treatment-grit chambers primary sedimentation, biological waste treatment e.g. activated sludge trickling filters followed by

secondary sedimentation, waste stabilization ponds, sludge treatment by anaerobic digestion and its disposal, waste water disposal and self purification of streams septic tanks.

Elements of air pollution, primary pollutants & their effects. Rural sanitation, environmental pollution and ecology

(E) Estimating and Costing

PART-II

(A) Water Resources Engineering

- Hydrology-Hydrologic cycle, precipitation, runoff. evapotranspiration and infiltration, Hydrographs, unit hydrograph, Flood estimation, frequency analysis.
- Planning for water Resources Ground and surface water resources; surface flows. Single and Multipurpose projects storage capacity reservoir losses, reservoir silting, flood routing. Benefit cost ratio, planning for optimum use of water resources.
- Water Requirements for crops-Quality of irrigation, water, consumptive use of water, water depth and frequency of irrigation duty of water irrigation methods and efficiencies.
- Design of distribution system for canal irrigation Channel capacity; channel losses Alignment of main and distributory channels. Canal lining types & design Working tables for canal.
- Water logging-Its causes and control design of drainage system; soil salinity
- River training principle and methods.
- Storage Works- Types of dams (including earth dams) and their characteristics, principles of design, criteria for stability, Foundation treatment, Joints and galleries Control of seepage.
- Spillways-Different types, their suitability & design. Energy dissipation Spill way crest gates.
- Cross drainage works. Necessity, types and their selection.

(B) Transportation Engineering

(i) Railways – Permanent way- Ballast, sleeper; chairs and fastenings; points and crossing, different types of turn outs, cross-over, setting out of points.

Maintenance of track, super elevation creep of rails, ruling gradients; track resistance; tractive efforts curve resistance.

Station yards and machinery of track, super elevation creep of rails, ruling gradients; track resistance; tractive efforts curve resistance.

Signal and interlocking; level crossing.

(ii) Highways and Airports- Classification of roads, planning and geometric design. Pavement materials; types, selection and testing.

Design and construction of flexible and rigid pavements of highways and airfields.

Causes of failure of pavements and road maintenance.

Traffic engineering- Traffic surveys; intersections; road signs; signals and marking.

Selection of airport sites wind rose diagram and runway orientation; runway and taxiway geometries runway and taxiway lighting.

(iii)Bridge Engineering- Types and their suitability selection of site, design data collection, computation of water ways and economic span, Loading for railway and highway bridges. Substructure- Types, Selection and Construction.

(C) Geotechnical Engineering:

(i) Soil Mechanics : Index properties and classification of soils.

Seepage – Flow through homogeneous isotropic and an isotropic earth dams.

Consolidation and settlement : Terzaghi's theory, determination of consolidation, parameters from Laboratory tests. Field compression curve. time-rate of settlement., settlement computation for under consolidated normally consolidated and over consolidated soils. Shear strength; Shear strength parameters – laboratory and field determination and their selection for the relevant field conditions. Stress path definition and typical paths for various shear tests and lateral earth pressure conditions. Skemption's pore- pressure coefficients A-B definition, determination and uses.

(ii) Foundation Engineering – Sub-surface exploration methods and their suitability. Methods of sampling. Soil improvement; various methods.

(a) Compaction – laboratory and field methods of compaction. Field control of moisture & density.

(b) Dewatering- Methods & their selection.

(c) Soil stabilization – methods and their applicability for different types of soils including expansive type of soils.

Shallow foundation – Laboratory and field methods of Bearing capacity determination. Principles of footing size determination.

Deep foundations Types & their suitability : -

(a) Pile foundation – Types & their selection. negative skin friction. Load carrying capacity of single piles and pile group foundation for expansive soils.

(b) Well foundation (cassions) types selection and design principles. Retaining walls & bulkheads – Analytical and graphical methods of earth pressure computation Determination of depth of embedment of depth of embedment of sheet pile walls.

Stability of slopes – Types of fallure surfaces, stability analysis of earth embankments for various conditions. Elements of machine foundations. modes of vibration requirements of Machine foundations.

(iii)Rock Mechanics – Physical properties and engineering classification of rocks, General Consideration of foundation problems in igneous, sedimentary and metamorphic rocks.

SYLLABUS OF ASSISTANT ENGINEER ELECTRICAL

PART- I

Networks –

Network function, Transient and steady state frequency response, Laplace Transform, Pole Zero analysis, Element s of Network synthesis-two elements network synthesis (LC, RL and RC)

Electromagnetic field and materials–

Laplace's and Poisson's equations simple soluitons boundry value problems, maxwell's equation. Electron magnetic wave propagation.

Polarization, Dielectric constant, dielectric materials, behavior of dielectrics in alternating field. magnetic dipole. classification of magnetic materials. Conductivity, of metal's thermal conductivity super conductivity Classification of semiconductors.

Measurement –

Basic methods of measurements. Measurement of frequency and phase using CRO, Measurement of resistance, inductance, mutual inductance and capacitance using bridges, Electronic Measurement, Counters, Use of Opamplifiers in instrumentation.

Electronics –

R.C. Coupled amplifiers and Oscillators. (LC and RC) Hartley-Colpitts, Phase shift oscillators, calculation of current and voltage gain. Input and output impedance of transistor amplifiers (Both Bipolar and Unipolar: Small signal) Large signal amplifiers and their analysis. Wave shapping circuits and analysis of time base generators, different types of multiveibrators and their uses. Digital circuits.

Industrial Electronics–

Principles and design of Single phase and three-phase, uncontrolled and controlled rectifiers smoothing filters, Regulated power supplies, Speed control of drive for E.C., induction and motors, Inverters, Choppers, different type of switching devices and their characteristics.

Estimating and Costing

PART – II

SECTION – A

Control Systems–

Mathematical modelling of dynamic linear control systems, State Variable formulation. Singal flow graphs, Transient response of first and second order systems. Steady state error, stability Hurwitz and Nyquist criterian frequency response techniques, Root locus techniques.

Reliability Engineering –

Random variables – Distribution function – Binominal Poisson and Normal Distribution functions general reliability function MTTF, Markov Process.

SECTION – B
HEAVY CURRENTS

Electrical Machines -

Single phase transformer- equivalent circuit, phasor diagram, tests, regulation&efficiency,Three phase transformer-connection, parallel operation. Induction machines, torque-Slip Characteristics, equivalent circuit circle diagrams, starters, speed control, double cage motor, Induction generator, Phasor diagram Characteristics and application of single phase motors.

Synchronous machines, types of synchronous machines, types of synchronous machine emf equation, phaseor diagram circle diagram; operation – on- infinite bus-bar synchronizing power, operating characteristics and performance for motor and alternator voltage Regulation.

Special Machines -

Amplidyne and Metadyne, operating characteristics and their application, Addition.

Power System & Protection-

Economics of different types of power stations, Tariffs, base load, peak load and pumped storage plants, Economics of different systems of d.c. and a.c. power distribution, transmissions line parameter calculation; concept of G.M.D. Short medium and long transmission lines. Insulatore voltage distribution in a string of insulators and grading of insulation Fault calculations by symmetrical components, load flow analysis, and economic operation, Steady state and transient stability cables, design of transmission line.Transmission & distribution system through under ground cable system.

Switchgear-

Protective Relay- Types & characteristic, Circuit Breaker- Types & characteristic, Methods of arc extinction, re striking and recovery voltage Protective schemes of equipment sand line protection. Surges, Travelling waves in transmission lines and protection against surges. Current Transformer, Voltage Transformer.

Industrial drives-

Electric motors for various drivers and estimate of their rating behavior of motors during starting, breaking and reversing operation, schemes of speed control for d.c. and induction motors.

Electric Traction-

Speed time curves in practice, calculation of specific energy consumption, rating characteristics of traction motors, Dielectric Heating and Induction Heating.

Utilization of Electrical Engineering-

Illumination of light, Heating element, Power Factor Correction

SECTION – C
LIGHT CURRENTS

Communication Systems-

Generation and detection of amplitude frequency-phase and pulse-modulated signals using oscillators, modulators and demodulators, Noise, channel efficiency Sampling theorem, T.V. transmission and receiving systems Antennas.

Feeders and receiving circuits, Transmission line at audio, radio and ultra high frequencies.

Microwaves -

Wave guides, components cavity resonators, microwave timers, microwave communication systems RADAR C.C. amplifiers difference amplifiers, choppers and analog computation techniques suing opamps Time and amplitude sealing simple function generators.

SYLLABUS FOR SUB. ENGINEER CIVIL

1) **Building Materials**

Bricks	Types, Indian Standard Classification, absorption, saturation, factor, strength in masonry, influence of mortar strength on masonry strength.
Cement	Compounds of different type, setting times, strength.
Cement Mortar	Ingredients, proportions, water, demand, mortars for plastering and masonry.
Concrete	Importance of W/C Ratio, Strength, ingredients, including admixtures, works ability, testing for strength, elasticity, non-destructive testing. mix design methods

2) **Structural Analysis:**
   Analysis of determinate structures different methods including graphical methods. Analysis of indeterminate skeletal frames – moment distribution, slope deflection, stiffness and force methods energy methods, Muller Breslau Principle of application.
3) **Design of Steel Structures :**
   Principles of working stress method. Design of connections, Simple member, Built-up section and frames, Design of Industrial roofs.
4) **Design of Concrete and masonry Structures :**
   working stress method of R.C. members.
   Principles of prestressed concrete design, materials structures.
   Design of Simple members and determinate structure.
5) **Construction practice, Planning and Management :**
   Concreting Equipment
   Weight Batcher, Mixtures, vibrator, plant, concrete pump.
   Cranes, hosts, lifting equipment.
   Earth work Equipment.
   Power shovel, hoe, dozer, dumper, trailers and rollers foot sheep foot rollers pumps
6) **Soil Mechanics :**
   Properties of soil, Classification and interrelationship : Compaction behavior, methods of compaction, permeability and seepage, flow nets, Inverted filters, compressibility and consolidation, shearing resistance, stresses and failure, soil testing in laboratory and insitu.
7) **Surveying :**
   Classification of surveys scales, accuracy, Measurement of distances direct and indirect methods, optical and electronic devices, Measurement of direction, prismatic compass, local attraction, Theodolites – type, Measurement of elevation- Spirit and trigonometric leveling.
8) **Transportation Engineering :**
   Planning of highway systems alignment and geometric design, horizontal and vertical curves, grade separation, Materials and construction methods for different surfaces and maintenance principle of pavement design.
9) **Estimating & Costing**
10) **PHE Services**

SYLLABUS FOR SUB. ENGINEER ELECTRICAL

1. **Introduction to A.C. Machines**
   - Overview of AC machines- Transformers, Alternator, Motor etc.
   - Difference between A.C.& D.C. Machines
   - Basic features of A.C. Machines
   - Parts of A.C. machines & their functions
   - Materials for the various parts
   - Stator & rotor windings
2. **Alternators**
   - Types of alternators
   - Principle & emf equation
   - Winding factors & its effect on induced emf.
   - Effect of frequency on induced emf.
   - Effect of speed & excitation on induced emf.
   - Different excitation systems.
   - Excitation system used in modern alternators
   - Concept of leakage, armature & synchronous reactance
   - Principle of working of brushiess alternators
   - Applications
3. **A.C. Motors.**
   - Types of A.C. motors
   - Stator & rotor parts, function, windings
   - Concept of rotating magnetic fields
   - Stator & rotor current equations
   - Effect of frequency on slip
   - Torque equations
   - Condition for maximum torque
   - Torque speed curves
   - Circle diagram
   - Necessity of induction motor starters and different types
   - Different types of induction motors
4. **HVDC/HVA AC System**
   - Merits & Demerits
   - Types of DC links
   - Controlled Rectification & filters
   - Reactive Power requirements
   - Controlled characteristics
5. **Power System & Protection**
   - Transmission & Distribution System through over head & underground cable
   - system
   - Relays & Circuit Breakers, C.T. & P.T.
6. **Inverters**
   - Need of invention
   - Inverter circuits using SCR in series and pareller mode
   - Circuit diagram of emergency tube light

7. Converters

- Need of converter, Types of converter (DC to DC and AC to AC)\
- Block diagram of chopper
- Circuit diagrams of chopper using switching transistors and SCRS
- Need of commutation, methods
- Single phase and three phase cyclo converter

8. Regulated power Supply

- Need of regulation
- Zener regulated DC power supply and its limitations
- Working of shunt and series regulated power supply suing transistor
- IC regulated power suppliers (Circuit diagram)
- Block diagrams of (SMPS) switch mode power supply
- AC stabilizer using tap changer
- Block diagram of servo stabilizer

9. Speed Control of Motors

- Advantages of speed control
- Separately excited DC motor single and three phase controlled rectifiers
- Methods of speed regulation fields failure protection, armature current limier (Block diagrams)
- Dual rectifier for reversal of rotation
- Speed control by chopper (block diagram)
- Circuit diagrams of speed control of single phase and three phase induction motor cyclo converter (slip ring)

10. Utilization of Electrical Engineering

- Illumination of Light, Heating element, Power Factor Correction

11. Estimating & Costing

पाठयक्रम (सहायक अभियंता – विद्युत)

नेटवर्क (NETWORK) –

नेटवर्क फॅक"ान, क्षणिक (Transient) एवं स्थिर (Steady) अवस्था आवृत्ति प्रक्रिया, लाप्लास रूपांतरण (Laplace Transformation), पोल–शून्य (Pole-Zero) वि"लेषण, नेटवर्क सं"लेषण, दो तत्व नेटवर्क सं"लेषण के तत्व (एल–सी , आर–सी, एवं आर– एल)

इलेक्ट्रामैग्नेटिक सामग्री और फील्ड (ELECTROMAGNETIC MATERIALS & FIELDS)–

लाप्लास एवं पायसन समीकरण (Laplace & Poisson's Equation), सरल समाधान सीमामान समस्यायें, मेक्सवेल समीकरण (Maxwell Equation), इलेक्ट्रान चुंबकीय तरंग प्रसार।

ध्रुवीकरण (Polarization), ढांकता हुआ (Dielectric), ढांकता हुआ सामग्री(Dielectric Materials), अल्टरनेटिंग फील्ड में ढांकता का व्यवहार, चुंबकीय द्विध्रुव, चुंबकीय सामग्री का वर्गीकरण, चालकता, धातु तापीय–चालकता, सुपर (अति) चालकता, अर्ध–चालकों का वर्गीकरण।

माप (MEASUREMENT) –

माप की बुनियादी विधि, सी आर ओ (CRO) का उपयोग कर आवृत्ति (Resonance) और चरण की माप, ब्रीज (Bridges) का उपयोग कर प्रतिरोध (Resistance), अधिष्ठापन (Inductance), आपसी अधिष्ठापन (Mutual-Inductance), एवं संधारित्र (Capacitance) का माप, इलेक्ट्रानिक माप, काउंटर, इन्स्ट्रूमेंटे"ान में ओपेम्प (OPAMP) का उपयोग।

इलेक्ट्रानिक्स ELECTRONICS) –

आर. सी. युग्मित एम्पलीफायर (RC-Coupled Amplifier), हाटले–कॉलपिट (एल.सी. और आर. सी.) ऑसिलेटर, फेस–ि"ाफ्ट ऑसिलेटर, धारा एवं वोल्टेज गेन (Current-Voltage Gain) का परिकलन, ट्रॉसिस्टर एम्पलीफायर (Transistor Amplifier) में इनपुट एवं आऊटपुट प्रतिरोध (द्वि–ध्रुवी और एक–ध्रुवीय दोनो) छोटे संकेत एव बड़े संकेत (Small Signal & Large Signal) एम्लीफायर और उनके वि"लेषण, तरंग आकार देने वाला सर्किट (Wave Shapping Circuits) व समय आधार जेनरेटर, विभिन्न प्रकार के मल्टीवाइब्रेटर एवं उनके उपयोग। डिजिटल सर्किट।

इंडस्ट्रीयल इलेक्ट्रानिक (INDUSTRIAL ELECTRONICS) –

एक चरण एवं तीन चरण (Single Phase & Three Phase) के सिद्धान्त एवं बनाने के विधि अनियंत्रित एवं नियंत्रित दिष्टकारी (Uncontrolled & Controlled Rectifiers), स्मुदिंग फिल्टर, विनियमित विद्युत आपूर्ति (Regulated Power SUpply), डी.सी. ड्राइव (DC-Drive) एवं प्रेरण मोटर (Induction Motor) के गति नियंत्रण, इनवर्टर (Inverter), चौपर (Chopper), विभिन्न प्रकार के स्वीचिंग डिवाइसेस और उनके लक्षण (Characteristics).

आकलन और लागत (ESTIMATING & COSTING)

भाग – अ

नियंत्रण प्रणाली (Control system) –

गणितीय प्रारुप (Mathematical modelling) की गति"ाील रैखिक नियंत्रण प्रणाली (Dynamic lincar contol system) , चर अवस्था निरूपण (State Variable Formulation), संकेत प्रवाह (Signal Flow) ग्राफ, पहला और दूसरा आदे"ा प्रणाली के क्षणिक प्रतिक्रया, स्थिर अवस्था त्रृटि, स्थिरता हरविट्ज एवं नाइक्वेस्ट मापदंड (Nyquist Criteria) आवृत्ति प्रक्रिया तकनीक (Frequency response Techniques), रूट–लोकस तकनीक (Root-Locus Technique)।

विश्वसनीयता इंजीनियरिंग (Reliability Engineering)–
रेंडम चर (Random Variable) – डिस्ट्रीब्यू"ान फॅक"ान– बाइनामिनल पायजन और नार्मल डिस्ट्रीब्यू"ान फंक"ान की वि"वसनीयता, एम टी टी एफ, मार्को प्रक्रिया।

भाग – ब
भारी करेंट (HEAVY CURRENTS)

इलेक्ट्रिकल मशीन (Electrical Machines)–

एकल चरण ट्रांसफार्मर – समकक्ष सर्किट, फेजर आरेख, टेस्ट, विनियमन और दक्षता, तीन चरण ट्रांसफार्मर, समानांतर प्रचालन, प्रेरण म"ाीन, टार्क स्लीप वि"ोषता, समकक्ष सर्किट वृत्त आरेख, स्टार्टर गति नियंत्रण, डबल केज मोटर, प्रेरण जनरेटर, फेजर आरेख, लक्षण और एकल चरण मोटर की अनुप्रयोग।

तुल्यकालिक म"ाीन (Synchronous Machines), पकार, तुल्यकालिक म"ाीन के ई.एम.एफ. समीकरण आरेख वृत्त आरेख, संचालन–अनंत बस–बार सिक्रनाइज शक्ति, मोटर एवं अल्टरनेटर के वोल्टेज विनियमन एवं संचालन व प्रद"ार्न।

विशेष मशीन (Spacial Machines) –

एम्पलीडाइन और मेटाडाइन, प्रचालन लक्षण और अनुप्रयोग।

विद्युत प्रणाली व संरक्षण (Power System & Protaction) –

पावर स्टे"ान क विभिन्न प्रकार के अर्थव्यवस्था, शुल्को (Tariffs), आधार लोड पीक लोड, पंप भंडारण संयंत्र, विभिन्न प्रकार के डी.सी. एवं ए.सी. विद्युत वितरण विभिन्न प्रकार की अर्थव्यवस्था, प्रेषण लाईन, पैरामीटर परिकलन जी.एम.डी. की अवधारणा, लघु एवं लंबी माध्यम प्रेषण लाईन, विसंवाहक (Insulatore), विंसवाहक की स्ट्रिंग एवं ग्रेडिंग में वोल्टेज वितरण फाल्ट परिकलन एवं समकित घटक, लोड फ्लो वि"लेषण व आर्थिक संचालन। स्थिर अवस्था एवं क्षणिक अवस्था स्थिरता केबल प्रेषण लाइन बनाने की विधि। जमीनी केबल प्रणाली के द्वारा प्रेषण एवं वितरण प्रणाली।

स्विच गियर (Switchgear) –

सुरक्षात्मक रिले – प्रकार और लक्षण, सर्किट ब्रेकर – प्रकार और लक्षण, आर्क एक्सटिंसन विधि, रिस्ट्राइकिंग व रिकवरी वोल्टेज सुरक्षात्मक योजना के उपकरण, रेत लाइन संरक्षण सर्ज (Surges), ट्रेवलिंग तरंग प्रेषण लाईन सर्ज के विरूद्ध संरक्षण। धारा ट्रासफार्मर, वोल्टेज ट्रान्सफार्मर।

इडस्ट्रियल ड्राइव (Industrial Drives) –

विभिन्न ड्राइव और उनकी रेटिंग का अनुमान, शुरूआत में मोटर का व्यवहार, ब्रेकिंग एवं रिवर्सिग प्रचालन (Operation), डी.सी. एवं प्रेरण मोटर के लिए गति नियंत्रण योजना।

विद्युत कर्षण (Electic Traction) –

गति समय अभ्यास वक्र (Curves), वि"ाष्ट ऊर्जा खपत की गणना, ट्रेक"ान मोटर की रेटिंग के लक्षण, ढांकता हुआ सीटिंग और प्रेरण हीटिंग।

इलेट्रिकल इंजीनियरिंग की उपयोगिता (Utilization of Electrical Engineering) –

रो"ानी, हिटिंग तत्व, शक्ति के कारक, सुधार।

भाग – स

संचार प्रणाली (Communication system) –

आयाम, आवृत्ति, चरण और पल्स माडुलेटेड सिग्नल की आक्सिलेटर द्वारा जनरे"ान एवं डिटेक"ान, माडुलेटर एवं डी–माडुलेटर, "ाोर (Noise), चैनल दक्षता, सेम्पलिंग प्रमेय, टी.वी. प्रेषण एवं प्राप्त प्रणाली एंटीना।

फीडर एवं रिसिविंग सर्किट, आडियो पर प्रेषण लाइन, रेडियो एवं अल्ट्रा हाई आवृत्ति।

माइक्रोवेव (Microwaves) –

वेवगाइड, कविटी रेजोनेटर के घटक, माइक्रावेव टाइमर, माइक्रोवेव संचार प्रणाली रडार, सी.वी. एम्पलीफायर, अंतर एम्लीफायर, चोपर और एनालॉग गणना तकनीक ओपेम्प द्वारा, समय और आयाम सिलिंग (Amplitude Sealing) करने वाला जनरेटर फॅक"ान।

पाठयक्रम (उप–अभियंता – विद्युत)

(1) एसी मशीन की प्रस्तावना (Introduction to A.C. Machines) –

- ए.सी. म"ाीन का अवलोकन – ट्रान्सफार्मर, अल्टरनेटर, मोटर इत्यादि।
- ए.सी. व डी.सी. म"ाीन के बीच अंतर।
- ए.सी. म"ाीन की बेसिक फीचर्स।
- ए.सी. म"ाीन के पार्ट एवं उनके कार्यप्रणाली (Function)।
- विभिन्न भागों के लिए सामग्रियॉ।
- स्टेटर एवं रोटर वाईडिंग।

(2) अल्टरनेटर (ALTERNATOR) –

- अल्टरनेटर के प्रकार ।
- सिद्धान्त और समीकरण ।
- वाईडिंग कारक (Winding Factor) और प्रेरित (Iinduced) ई.एम.एफ. का प्रभाव।
- प्रेरित ई.एम.एफ. पर आवृत्ति का प्रभाव।
- गति और उत्तेजना (Excitation) पर प्रेरित ई.एम.एफ. का प्रभाव।
- विभिन्न उत्तेजना (Excitation) प्रणाली।
- मार्डन अल्टरनेटर में उत्तेजना प्रणाली (Excitation Method) का उपयोग।
- रिसाव (Leakage), आर्मेचर और तुल्यकालिक प्रतिक्रिया (Synchronous Reactance) की अवधारणा।
- ब्र"ा"ा अल्टरनेटर के कार्य करने के सिद्धान्त ।
- एप्लीके"ान।

(3) ए. सी. मोटर (AC MOTOR)

- मोटर के प्रकार ।
- स्टेटर व रोटर के भाग, फन्क"ान, वाइडिंग ।
- चुम्बकीय क्षेत्र घुर्णन की अवधारणा।
- स्टेटर व रोटर के धारा समीकरण ।
- स्लीप (Slip) में आवृत्ति के प्रभाव।
- टार्क (Torque) समीकरण ।
- अधिकतम टार्क की स्थिति ।
- टार्क स्पीड अभिरेख (Torque-Speed Curve)।
- वृत्तीय आरेख (Circle Diagram)।

- प्रेरण मोटर स्टेटर और विभिन्न प्रकार की आव"यकता।
- विभिन्न प्रकार के प्रेरण मोटर (Induction Motor)।

(4) एच.व्ही.डी.सी./एच.वी.ए. एसी प्रणाली (HVDC / HVA-AC SYSTEM)–

- गुणात्मकता एवं अवगुण ।
- डी.सी. लिंक (DC link) के प्रकार ।
- नियंत्रित रेक्टीफिके"ान एवं फिल्टर ।
- प्रतिक्रिया"ाील (Reactive) शक्ति की आव"यकता।
- नियंत्रित वि"ोषता (Controlled Characteristics)।

(5) भाक्ति प्रणाली एवं सुरक्षा (Power System & Protection) –

- संप्रेषण एवं वितरण प्रणाली के माध्यम से ओव्हर–हेड एवं भूमिगत केबल (Over-Head & Underground Cable)।
- रिले एवं सर्किट ब्रेकर, सी.टी. एवं पी.टी.।

(6) इन्वर्टर (INVERTER)–

- इन्वर्टर की आव"यकता।
- इन्वर्टर सर्किट की श्रृंखला एवं समानांतर मोड (Series & Parallel Mode) में एस. सी.आर.(SCR) का उपयोग।
- इमरजेंसी ट्यूब लाईट का आरेख (Circuit Diagram)।

(7) कन्वर्टर (CONVERTER)–

- कन्वर्टर की आव"यकता, कन्वर्टर के प्रकार (डी.सी. से डी.सी., एवं ए.सी. से ए.सी.)।
- चोपर (Chopper) का ब्लॉक डायग्राम।
- स्विंचिंग ट्राजिंस्टर एवं एस.सी.आर. के उपयोग द्वारा चोपर का सर्किट डायग्राम।
- कम्यूटे"ान (Commutation) की आव"यकता, विधि।
- सिंगल फेस एवं तीन फेस साइक्लो कन्वर्टर (Cyclo Converter)।

(8) विनियमित विद्युत आपूर्ति –

- विनियमन (Reglation) की आव"यकता।
- जेनर विनियमित डी.सी.पावर सप्लाई एवं इसके सीमायें।
- ट्रांजिस्टर के उपयोग द्वारा संट (Shunt) एवं श्रृंखला (Series) में विनियमित पावर सप्लाई।
- आई.सी. (IC.) विनियमित पावर सप्लाई (सर्किट डायग्राम)।
- स्वीच मोड पॉवर सप्लाई (SMPS) का ब्लॉक डायग्राम।
- टैप चेंजर (Tap Changer) के उपयोग द्वारा ए.सी. स्टेबलाइजर।
- सर्वो स्टेबलाइजर का ब्लॉक डायग्राम ।

(9) मोटर की गति नियंत्रण (SPEED CONTROL OF MOTOR.) –

- गति नियंत्रण के लाभ।

- एकल एवं तीन फेस गति नियंत्रण मे अलग से उत्तसाहित (Seperately Excited) डीसी मोटर।
- गति विनियमन विधि, फील्ड फेलियर संरक्षण, आर्मेचर धारा लिमिटर (ब्लॉक डायग्राम) ।
- उत्क्रमण के रोटे"ान के लिए द्वि–दिष्टकारी (Dual- Rectifier) ।
- चोपर के गति नियंत्रण (ब्लॉक डायग्राम)।
- एकल एवं तीन फेस प्रेरण मोटर के गति नियंत्रण का सर्किट डायग्राम। साइक्लो कन्वर्टर (Cyclo Converter स्लीप रिंग)।

(10) इलेक्ट्रिकल इंजीनियरिंग की उपयोगिता (Utilization of Electrical Engineering) –

- रो"ानी, उष्मक तत्व (Heating Element) पॉवर फेक्टर करेक्टर (Power Factor Correction) ।

(11) आकलन और लागत (Estimating & Costing) –
