

MODULE - 1

Chapter 1 : Mechanical Systems In Buildings

1-1 to 1-31

Syllabus : Lifts/elevators, escalators, conveyors: their components, capacity and principles of working, common problems. Motors, Generators, Pumps, HVAC Systems - Heating systems, Cooling Systems, Packaged HVAC, types, capacity, components and their principles of working, common problems.

1.1 Elevators, Escalators and Conveyors 1-1

 1.1.1 Elevators 1-1

 1.1.2 Escalators 1-6

 1.1.3 Conveyors 1-10

1.2 HVAC Systems 1-11

 1.2.1 Heating Systems 1-12

 1.2.2 Cooling systems 1-12

 1.2.3 Packaged HVAC 1-15

1.3 Motors 1-18

 1.3.1 Principle of an Electric Motor 1-18

1.4 Generators 1-21

 1.4.1 Components of a Generator 1-22

1.5 Pumps 1-27

 1.5.1 Working of Pumps 1-27

 1.5.2 Components of Pump 1-28

MODULE - 2

Chapter 2 : Electrical Systems and Illumination in Buildings

2-1 to 2-34

Syllabus : Electrical grids and supply system : Layout of substations Transformers and switch gears, Main and distribution boards, electrical systems in buildings, Single / Three phase supply, ISI specifications, electrical load, electrical layout plan in a building, Types of wires, wiring system & their choice, Solar energy, CCTV, LAN. Protective devices in electrical installation: Earthing for safety, Types of Earthing, fuses, circuit breakers, lightening arrester. Principles of Illumination Design: Visual task, Factors affecting visual task, Luminous flux, candela, solid angle illumination, utilization factor. Modern theory of light and colour: Synthesis of Light, Additive & Subtractive synthesis of colour, classification of lighting, artificial lights sources, spectral energy distribution, luminous efficiency, colour temperature, colour rendering. Level of illumination: Lighting for stores, offices, school, hospitals and house lighting, elementary idea of special features required and minimum level of illumination required in buildings.

2.1 Electrical Network Systems 2-2



2.1.1	Electrical Distribution System in India.....	2-2
2.1.2	Single Phase (1- ϕ) and Three Phase (3- ϕ) Systems	2-3
2.1.3	Types of Current in Electrification.....	2-4
2.1.4	Domestic Electrification	2-5
2.1.5	Protective Electrical Safety Devices in Electrical Installations	2-8
2.1.6	What is Grounding or Earthing?	2-12
2.1.7	Need of Earthing or Grounding	2-12
2.1.8	Components of Earthing System	2-13
2.1.9	Types of Earthing	2-13
2.1.10	Solar Power Systems	2-17
2.1.11	Electronic Surveillance System.....	2-20
2.1.12	Local Area Network (LAN).....	2-24
2.2	Principles of Illumination and Modern Lighting Systems.....	2-25
2.2.1	Light Quantity.....	2-25
2.2.2	Light Quality.....	2-27
2.2.3	Energy Consumption	2-31
2.2.4	Lighting Uses.....	2-33

MODULE - 3

Chapter 3 : Plumbing Systems in Building

3-1 to 3-32

Syllabus : Water Distribution system : Material for service pipes, service connection, size of service pipe, Water meter, valves and storage tanks, water requirement for domestic use and fire fighting. Drainage system : Pipe and traps, system of plumbing, house drainage plans, Chambers- gradient and spacing, manholes, septic tanks and soak pit, Introduction to rain water harvesting system. Other plumbing systems : Fire safety, fire-fighting installations, types and purpose, piped gas supply systems, AC ducting.

3.1	Water Distribution System.....	3-1
3.1.1	Overhead Water Tank.....	3-2
3.1.2	Plumbing Pumps	3-3
3.1.3	Pipes	3-3
3.1.3.1	Types of Pipe Joints in Plumbing.....	3-5
3.1.4	Fittings.....	3-6

3.2	Drainage System	3-9
3.2.1	Drain Pipes or Waste Disposal Pipes.....	3-9
3.2.1.1	Drainage Pipes Based on Material of Manufacturing.....	3-11
3.2.1.2	Chambers in Drainage System.....	3-12
3.2.1.3	Manhole.....	3-12
3.2.1.4	Septic Tank	3-13
3.2.1.5	Soak Pit.....	3-13
3.2.2	Sewage Treatment.....	3-14
3.2.3	Rainwater Harvesting	3-17
3.3	Fire Safety Systems	3-18
3.3.1	Causes of Fire in the Buildings and Fire Hazards.....	3-19
3.3.2	Safety Regulations	3-20
3.3.3	Fire Safety Installation.....	3-21
3.3.4	Fire System Design.....	3-25
3.3.5	Fire Protection for Buildings.....	3-26
3.4	Piped Gas System.....	3-30
3.5	AC Ducting.....	3-31

MODULE - 4

Chapter 4 : Deterioration of Concrete Structures and Condition Assessment

4-1 to 4-35

Syllabus : Durability and Causes of deterioration of concrete structures : effects of climate, moisture, temperature, chemical, wear, erosion and loading on serviceability and durability. Design errors and construction errors, causes of seepage and leakage in concrete structures, formation of cracks including those due to corrosion. Condition Survey, Evaluation and Damage Assessment : Structural audit and bye laws. Diagnostic methods and analysis. Destructive, semi-destructive and non-destructive methods: core test, carbonation test, chloride test, petrography, corrosion analysis, cover meter test, rebound hammer test, ultrasonic pulse velocity test, and crack measurement techniques, Concrete endoscopy and thermal imaging, pull- off test and pull-out test.

4.1	Deterioration of Concrete.....	4-1
4.1.1	Durability of Concrete.....	4-1
4.1.2	Causes of Deterioration of Concrete	4-2
4.1.3	Seepage and Leakage in Concrete Structures	4-11
4.2	Condition Survey.....	4-16

4.2.1 Diagnostic Methods in Condition Assessment 4-20

4.2.2 Repair Analysis 4-34

MODULE - 5

Chapter 5 : Repair Materials and Methodologies for Repairs

5-1 to 5-35

Syllabus : Repair analysis, Repair materials : and their desired properties, Polymer modified mortar/ concrete, micro concrete, bonding chemicals, protective materials and their properties for moisture barrier systems, water-proofing of concrete structures, Systems like integral, crystalline, coatings, membranes, joints sealants, crack repair fillers, corrosion resistant steels, Pre-packed zinc sacrificial anode, Snap-On zinc mesh anode CP system, corrosion inhibitors, rust solvents. Repair methodologies : Crack and patch repair, Injection grouting, surface coatings, column jacketing, guniting, shotcrete, Ferroconcrete, FRP, Carbon fiber wrapping, methods of rebar corrosion protection, cathodic protection.

5.1 Repair Materials..... 5-2

5.1.1 Cement Mortar 5-3

5.1.2 Grout..... 5-5

5.1.3 Latex Modified Portland Cement Mortar or Concrete..... 5-8

5.1.4 Micro Concrete- Quick Setting Non-shrink Mortar 5-8

5.1.5 Polymer Concrete..... 5-10

5.1.6 Epoxy Mortars with are Sin-hardener Formulation 5-12

5.1.7 Concrete Chemicals and Surface Coatings 5-14

5.1.8 Corrosion Inhibitors 5-15

5.1.9 Paints in Buildings..... 5-15

5.1.10 Rust Solvents..... 5-21

5.1.11 Pre Packed Zinc Sacrificial Anode..... 5-22

5.2 Repair Methodologies 5-22

5.2.1 Special Repair Methods..... 5-24

5.2.2 Reinforcement Corrosion and Mitigation..... 5-29

5.2.3 Waterproofing..... 5-32

MODULE - 6

Chapter 6 : Repair Process Implementation and Safety During Repairs

6-1 to 6-12

Syllabus : Legal Documentation and Records : Estimates of repair work, procedure and flow chart for repairs, Bill of quantities, Tendering, Work order, Agreement and Contract, Measurement book, bills, security deposits, role of PMC.

Safety during Repairs : Causes of accidents, safety signs, barricading, insurance, Temporary Support structures such as, formwork, shuttering, centering, staging and scaffolding.

6.1 Legal Documentation and Records..... 6-1

6.1.1 Tendering..... 6-2

6.1.2 Draft Tender..... 6-3

6.1.3 Work Order..... 6-4

6.1.4 Agreement and Contract..... 6-4

6.1.5 Measurement Book 6-5

6.1.6 Bill / R A Bill..... 6-5

6.1.7 Security Deposits 6-6

6.1.8 Types of Payment..... 6-6

6.1.9 Role of Project Management Consultancy..... 6-7

6.2 Safety During Repairs 6-8

6.2.1 Reasons of Accidents..... 6-8

6.2.2 Safety Measures, Corrective / Preventive Actions taken at Construction Site..... 6-9

6.2.3 Barricading and Fencing..... 6-9

6.2.4 First Aid and Insurance..... 6-10

6.2.5 Temporary Support Structures..... 6-10

