HARYANA PUBL IC WORKS DEPARTMENT
(BUILDILNGS & ROADS)

From

Engineer-in-Chief, Haryana,
PWD (B&R) Branch, Chandigarh.

To

The Director General
Haryana Institute of Public Administration
76, HIPA Complex, Sector-18, Gurugram,
Haryana (122015).

Memo No. 17462 /ES-I Dated 6.2.2025

Subject: - **Departmental Professional Exam of AEs/SDEs (Civil, Elect, Mech, & Horticulture) of Haryana Public Works (B&R) Department.**

Please find enclosed herewith the approved syllabus for Departmental Professional Exam of AEs/SDEs (Civil, Elect, Mech, & Horticulture) of Haryana Public Works (B&R) Department. It is requested to prepare the question paper to test on the basic and practical knowledge so that examination could be conducted within 15 days positively.

DA/As above

Dy. Superintendent/ES-I
for Engineer-in-Chief, Haryana,
PWD (B&R) Br., Chandigarh.

Department Professional Examination for Sub-Divisional Engineers/Assistant Engineers (Civil) of Haryana PWD B&R

(Roads and Bridges)

Syllabus

1. Planning of Highway systems, alignment and geometric design, horizontal and vertical curve, grade separation, material and construction method for different surface and maintenance. Principle of pavement design, Type of subgrade material,
2. Types of pavements

* **Flexible pavements**: Introduction to flexible pavements, pavement materials and its characteristic properties, factors affecting design of pavements, wheel load factor, climatic factors, structure of pavement, stresses in the pavement, CBR method of design, field tests, Types and frequency of tests, sampling and quality control, drainage etc.

* **Rigid pavements**: Introduction to rigid pavements, structure of the pavement, characteristic properties of different layers of the pavement, design of pavement using IRC method, factors affecting design of pavements, stresses in the pavement, field tests, Types and frequency of tests, sampling and quality control, drainage etc.

3. **Road safety**: General principles of road safety audit. Various components of road safety used during construction and post construction of work. Various items of road safety furniture, road markng and road safety engineering. Identification of road signages.

4. **Bridges/ROB/Flyover/RUB**:Componentsofbridges/ROB/Flyover/RUB,Site investigation for design of bridges, types of bridges, IRC loads on bridges, general design requirements, box culvert, selection of suitable type of bridge, economic span, erection of superstructure, pre-stressed concrete bridges, maintenance of bridges/ROB/Flyover/RUB.

5. **Substructures**: Importance of soil-structure interaction, piers and abutments, open foundation, pile foundation, well foundation, type of bearings, requirements of expansion joint, types of expansion joint, parapets and railings for highway bridges.

6. **Soil Properties**: Basic soil properties, classification of soil, effective permeability, shear strength of soil and its testing, concept of compaction, water content density relationship, zero air void line, standard proctor and modified proctor test, optimum moisture content, placement water content, field compaction control, factors affecting compaction, field compaction methods, suitability of various compaction equipment.

Department Professional Examination for Sub-Divisional Engineers/Assistant Engineers (Civil) of Haryana PWD B&R

(Material and Construction)

Syllabus

Bricks: Characteristics of good earth for brick, harmful ingredients, manufacturing of bricks, characteristics of good bricks, classification of bricks as per IS-1077, basic terms in brick masonry, brick laying tools, bonds in bricks, Inspection of brickwork, testing of bricks, cavity wall, sampling and quality control in brick masonry work, frequency of tests.

Concrete: Grades of concrete, testing of concrete, sampling and quality control in concrete construction, curing, design mix guidelines of IS 10262, constituents of concrete, high performance concrete, chemical admixtures in concrete, workability of concrete, mechanical and durability properties of concrete, guidelines of IS 456, sampling and quality control in concrete, frequency of tests.

Cement: Types of cement, constituents of cement, packaging of cement, grades of cement, special cements, manufacturing of cement, basic properties of cement compounds, sampling and quality control, testing of cement, mineral admixtures in cement.

Aggregate: Classification of aggregates, characteristics of aggregate, deleterious materials and organic impurities, soundness, alkali aggregate reaction, coarse aggregates, fine aggregates, guidelines of IS 383, testing of aggregates, sampling and quality control in aggregates, sub grade materials, sub base course materials.

Bitumen: Types of bitumen, constituents of bitumen, bituminous materials, properties of bitumen, testing of bitumen, sampling and quality control in bituminous construction in building and road works.

Steel: Types of steel, Necessary Tests required. Various types of sections, Strength, Uses, Sections, Calculation of weight.

Tiles: Types of tiles, Outdoor indoor tiles, Grades of tiles, Selection criteria of tiles as per their Uses.

Wood: Types of wood/plywood and Its uses in building work, necessary Tests required for wood, requirement of wood work in building construction.

False ceiling: Types of false ceiling, type of material used, necessity/requirement of false ceiling.

Paints: Different type of paints, selection criteria for paint on the basis of its use and suitability, constituents of paint.

Glass: Types of glass, Standards, Manufacturing proces, Requirements as per type of building (Residential/Commercial).

Standards: The guidelines of IS, IRC and MoRTH relevant to materials, testing, sampling, quality control in construction.

Structural analysis: - Analysis of determinate structure- different methods including graphical method. Analysis of indeterminate skeletal frames- moment distribution, slope-deflection, stiffness and force method, energy method, muller- principle and application. Elasticity of indeterminate beams and simple shape factors.

Design of steel structures: - Principles of working method. Design of connection, simple, Built-up section and frames, Design of Industrial roads. Principles of ultimate design. Design of simple member and frame.

Design of concrete and masonary structure:- Limit state design for be bending moment, axial compression and forces. Codal provision for slabs, walls and footing. Working stress method of design of R.C. member.

Principle of pre-stressed concrete design, method of prestressing, Design of simple member and determinate structure. Introduction to prestressing of indeterminate structure.

Construction, Planning and Management: Bar chart, linked bar chart, work-break down structure, Activity-on-arrow diagrams, critical path, probabilistic activity durations, event based network.

Department Professional Examination For Sub Divisional Engineers Assistant Engineers (Civil) Of Haryana Pwd B&R

Syllabus

(WATER SUPPLY AND DRAINAGE)

A) **Water Supply**

Water quality and quantity, Design period, Population forecast, Per capita supply, Recommended per capita water supply levels for designing scheme, Quality standards

Recommended guidelines for physical and chemical parameters, Bacteriological quality of drinking water, recommended treatment for different water sources, Kinds of water sources and their characteristics, Pipe materials, Water hammer

Methods of treatment, Chemicals handling and feeding, Filtration, Criteria for a good disinfectant, Mechanisms of disinfection Chlorination, Chlorine residual, Urban /Rural water supply distribution system, House service connections.

Selection of pumps, Basics of Operation and maintenance of distribution system, Basics of Operation and maintenance of water treatment plants.

B) **Sewerage System**

Need for Sewerage system, Basic design considerations, Design period Population forecast, Sewage characteristics, Hydraulics of sewers.

Velocities. Sewer appurtenances, Manholes, House sewer connections, Storm water inlets, Sewer ventilators, Type of materials, Type of loads, Loads on conduits due to backfill, Load on conduit due to super Imposed loads. Construction of sewers, Trench, Tunneling, Laying of pipe sewers, Jointing of sewers. Hydraulic testing of pipe sewers, Maintenance of sewerage systems.

House connections, Sewer cleaning equipment and procedures, Safety equipment, Sewage and storm water pumping stations, Type of pumping stations.

Type of Pumps, Degree and type of treatment of sewerage, Design period, Screening, Grit removal, Sludge thickening dewatering, digestion and disposal, Tertiary treatment of sewage for reuse. Effluent disposal and utilisation.

C) **Sanitary installation and a fire fighting in buildings**

Necessity of sanitary Installation in building Type of sanitary installation.

Necessity of traps used in sanitary installation, Type of traps, Double piping system, Sanitary installation in high rise buildings, Ventilation, Water storage tanks, Necessity

Capacity, planning of sewerage and storm water system in building complex

Various connection of building with master services of area, Necessity of provision of fire fighting system in high rise buildings, Type of fire fighting equipment

Dry type fire fighting equipment, Design of wet type fire fighting system with equipment.

(D) Management of Rain Water.

Importance of management of rain water by collecting, storing, and using rain water to conserve water, weather forecast, rain water harvesting system with diagram.

(E) Environment Engineering: - Atmosphere, Ecology, Ecosystem Habitant, Energy flow, food chain, Population Growth Effect, Water & waste water management. Air pollution, solid and hazardory waste management, Global and regional Environment issue. Environment Management and sustainable development.

Department Professional Examination for Sub-Divisional Engineers/Assistant Engineers (Civil/Mechanical) of Haryana PWD

B&R

Simple Electrical Engineering

Syllabus

Module 1: Electric circuits:

DC Network: Electrical circuit elements, active and passive elements, voltage and current sources, Ohm's Law, Kirchhoff's laws, Mesh and nodal methods of analysis, Thevenin's, and Maximum Power Transfer Theorem.

AC Network: Representation of Sinusoidal waveforms-Average and r.m.s values, form and peak factors. Analysis of single-phase AC Circuits consisting R-L-C combination (Series and Parallel).

Module 2: Electromagnetic Fields & Magnetic Materials

EM Theory:- Electric Field Intensity, Electric Flux Density, Ampere's Law.

Magnetic Materials: Analogy between electric & magnetic circuits, Magnetomotive force, Reluctance, Magnetic circuits, Single phase transformer, Principle and operation of transformer, Step up transformer, Step down transformer, Auto-transformer, Efficiency, Advantages & Disadvantages, Applications of Auto transformer.

Module 3: Measuring Instrumentation and Electric Machines

Electrical Machines: EMEC principles; DC machines Principle and Construction, applications of DC motors, Induction motor, Principle and construction, Single Phase Induction motor Principle of operation and introduction to methods of starting, applications.

Measuring Instrumentation: Type of instruments, construction and working principles of PMMC and moving iron type voltmeters & ammeters, Current and potential transformer, electronic instruments: Voltmeter, Multimeter, Wattmeter and energy meter.

Module 4

Electrical Installation in Building work:- Graphical symbols in electrotechnology, Voltage limits for AC system (Low or medium voltage, high voltage, extra high voltage), Types of wiring , Electrical Panel, distribution Box, MCB, MCCB.

Module 5

Electrical Earthing and Protection of Building against Lightning:- Electrical earthing, types of earth electrodes, advantages of electrical earthing, Lightning arrester.

Module 6

Other Services:- Solar Power Plant system, DG Set,Air Conditioners.

Department Professional Examination for Sub-Divisional Engineers/Assistant Engineers (Civil) of Haryana PWD B&R

Syllabus

Simple Mechanical Engineering

1. **Basics of Automobiles**

   Transmission system -Parts of Transmission system, Needs of Transmission system ,Types of Transmission system , Front Wheel Drive, Four Wheel Drive ,Rear Wheel Drive, , Chassis and its components in automobile system, Application of chassis in automobiles, Frame, Engine, Clutch, Gear box, Propeller shaft and Universal Joint, Front axle, Rear axle and Differential, Suspension system, Steering system, Braking system, Wheel and tyre, Different batteries and Electrical system.

2. **Basic of Refrigeration & Air Conditioning:-**

   What is Refrigeration, Compressor, Condenser, Expansion Devices, Evaporator, Refrigerants, Multi Pressure System, Complete Vapour Compression System, Properties of Moist air, Fans, Solar radiations, Refrigeration and air conditioning control system, Design Conditions, Application.

3. **Machinery used in mechanical workshop for repair and maintenance of vehicles /Machinery**

   Wheel Alignment & Balancer Machine-Function and Application, Tyre Changing Machine, Air Compressor-Function and Application, Two Post Hydraulic Lift-Function and Application, Pneumatic Impact Wrench-Function and Application, Nitrogen Inflator Machine, Oil Drainer-Function and Application.

4. **Basic Machining Process:-**

   Introduction of welding, soldering , Brazing, , Metal Forming, Forging , Defects, Rolling, Extrusion or Wire drawing, Casting Process, Die Casting, Lathe Machine-Function, Type & Application, Shapers and planers-Function, Type &Application, Drilling Machines-Function, Type & Application, Milling Process-Function, Type &Application, Grinding Process-Function, Type & Application, Welding Process-Function, Type &Application

5. **Major Construction Equipment Used In Road / Building Construction:-**

   Trucks, Tractors, Tractor Trolley, Water Tanker, Inspection Vehicles(Jeep, Vans, Cars), Road maintenance van, Bulk bitumen tankers/distributors, Grit spreaders, Tar boilers/trollies, Road Rollers, Excavator/ Backhoe Loader, Hot Mix Plant.

6. **Amur Estimates/Manufacture Estimates:-**

   AMUR Estimate for Jeep/Car/ Truck, Manufacture Estimates of LCV / Jeep.

7. **Layout and Maintenance of Machinery:-**

   Maintenance, servicing and upkeep of machinery, Safety measures /precautions, Layout of A type workshop, Layout of B type workshops, Layout of c type workshops, Working life of machinery, Different batteries and tyre size.

Department Professional Examination for Sub-Divisional Engineers/Assistant Engineers (Mechanical) of Haryana PWD B&R

Syllabus

Mechanical Engineering

1. **ENGINEERING MECHANICS**

Introduction to Mechanics: Force moment and couple, principle of transmissibility, Varignon's theorem. Resultant of force system- concurrent and non-concurrent coplanar forces, Types of supports (Hinge, Roller) and loads (Point, UDL, UVL), free body diagram, equilibrium equations and Support Reactions. Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety.

THEORY OF MACHINES: Displacement, velocity and acceleration analysis of plane mechanisms, dynamic analysis of linkages, cams, gears and gear trains, flywheels and governors; balancing of reciprocating and rotating masses, gyroscope.

2. **MATERIALS FOR MANUFACTURING**

Introduction of Engineering Materials- Classification, mechanical Properties of metals and uses of Ferrous Metals-Pig Iron, Cast Iron, Wrought Iron, steel, Classification of Steels according to Carbon content, Introduction to High speed Steels-18-4-1 HSS & uses. Introduction, Purposes and methods of Heat treatment-Annealing-Normalizing-Hardening-Tempering and Case Hardening.

3. **BASIC FABRICATION PROCESS**

Introduction to Welding-Classification of welding- Principle of Arc welding, Gas welding. Types of Arc welding-MIG Welding, TIG Welding, Submerged arc welding. Principle of resistance welding – Spot, butt, seam Welding. -Welding Defects and remedies. Comparison of welding, soldering and Brazing.

4. **METAL CASTING PROCESSES**

Introduction to metal castings, Use of patterns, Pattern materials, types of Patterns-single, Split, loose Piece, Sweep, Skeleton, gated Patterns, allowances, Types of Molding sand and Properties. Concept of Cope, Drag, Runner, Riser & core. Permanent mold casting – Die casting, Slush Casting, Centrifugal casting, Name and brief explanation of Defects in Castings.

5. **LIMITS,FITS,TOLERENCE & TESTING OF GEOMETRIC DIMENSIONS**

Concepts- Interchangeability, Selective Assembly, Basic Definitions, Graphical illustration of limits and Tolerances. Fit-Classification of fits. Systems of fits-Hole Basis System and Shaft Basis system, Systems of tolerance-Unilateral System and Bilateral System.

6. **THEORY OF METAL CUTTING**

Introduction: Metal Removal Processes, Types Of Machine Tools – Theory Of Metal Cutting: Chip Formation, Orthogonal Cutting- Oblique Cutting- Machinability of metal. Cutting Tool-Classification of cutting tools-Single point Cutting Tool Geometry-Cutting Tool Materials, Tool Wear, Tool Life, and Cutting Fluids-Functions and properties.

7. **LATHE AND OPERATIONS**

Centre Lathe-Construction- Various Operations, Taper Turning Methods, Thread Cutting operation, Lathe Attachments& Accessories. Capstan and Turret Lathes – Automats – Single Spindle, Swiss Type, Multi Spindle Automatic lathe.

8. RECIPROCATING MACHINE TOOLS

Shaper -Principal parts, Classification, Specification of shaper, Shaper Mechanisms, Types of shaper Machine. Cutting Speed, Feed, Depth of cut & machining time-Various

shaper operations-Introduction to Planer -Principal parts and working of Double housing Planer, Principal parts of Slotter-Working of slotter.

9. DRILLING AND MILLING MACHINES

Drilling operations- Twist drill geometry –Radial drilling machine-Jigs and Fixtures Definition-Need of Jigs and Fixtures Drill Jig-Locating devices. .Milling-Classification, Column and knee type milling machine - Milling cutters and classification-Fundamentals of milling processes-Milling operations. Indexing methods-Simple and compounding. Cutting speed, feed, depth of cut and machining time.

10. SUPER FINISHING PROCESSES

Abrasive Processes- Grinding Wheel – Specifications And Selection, Types Of Grinding Process – Cylindrical Grinding, Surface Grinding, Centre less Grinding–Super finishing process- Honing, Lapping, Super Finishing, Polishing And Buffing.

11. NON CONVENTIONAL MACHINING PROCESS

Unconventional Machining Process - Classification, Electron Beam Machining, Laser Beam Machining, Electric Discharge Machining, Ultrasonic Machining, Abrasive Jet Machining. Additive manufacturing-Concept – Various applications of Additive manufacturing.

12. AUTOMOBILES

Introduction to automobiles:- Classification, components, requirement of automobiles body, vehicle frame, Separate body & Frame, unitized body, car body style, bus body and commercial vehicle body types, Safety consideration- Safety features of latest vehicle, Feature trends in automobiles, Transmission system -Parts of Transmission system, Needs of Transmission system ,Types of Transmission system ,Front Engine Rear Wheel Drive , Front Engine Front Wheel Drive, Front Engine Four Wheel Drive ,Rear Engine Rear Wheel Drive, , Chassis and its components in automobile system, Application of chassis in automobiles, Frame ,Engine ,Clutch ,Gear box , Propeller shaft and Universal Joint, Front axle, Rear axle and Differential , Suspension system , Steering system ,Braking system ,Wheel and tyre ,Different batteries and Electrical system, Catalytic convertor, Turbocharger with intercooler, Emission control norms and standards, Ignition System.

13. REFRIGERATION & AIR CONDITIONING:-

What is Refrigeration, Compressor, Condenser, Expansion Devices, Evaporator, Refrigerants, Multi Pressure System, Complete Vapour Compression System, Properties of Moist air, Fans, Solar radiations, Refrigeration and air conditioning control system, Design Conditions, Application.

14. MACHINERY USED IN MECHANICAL WORKSHOP FOR REPAIR AND MAINTENANCE OF VEHICLES /MACHINERY

Wheel Alignment & Balancer Machine-Function and Application, Tyre Changing Machine, Air Compressor-Function and Application, Two Post Hydraulic Lift-Function and Application, Pneumatic Impact Wrench-Function and Application, Nitrogen Inflator Machine, Oil Drainer-Function and Application.

15. **INTRODUCTION TO MEASUREMENT AND MATERIALS & MANUFACTURING ENGINEERS:**

Introduction to Measurement: Concept of Measurement, Error in measurements, Calibration, measurement of pressure (Bourdon Tube Pressure and U-Tube Manometer), temperature (Thermocouple and Optical Pyrometer), mass flow rate (Venturi Meter and Orifece Meter), Strain (Bonded and Unbonded Strain Gauge), force (Proving Ring) and torques (Prony Brake Dynamometer); Concepts of accuracy, precision and resolution.

16. **Engineering Materials**: Structure and properties of Engineering Materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.
17. **Casting, Forming and Joining Processes**: Different types of castings, designs of patterns, moulds and cores; solidification and cooling; riser gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding.
18. **MAJOR CONSTRUCTION EQUIPMENT USED IN ROAD CONSTRUCTION**

Road Rollers, Trucks, Tractors, Tractor Trolley, Water Tanker, Inspection Vehicles(Jeep, Vans, Cars), Road maintenance van, Bulk bitumen tankers/distributors, Grit spreaders, Tar boilers/trollies.

19. **EARTH MOVING AND COMPACTION**

A. Earth Moving-Bull Dozers (Track/ Wheel), Dumper (Track / Wheel),Excavator/ Backhoe Loader (Track/ wheel), Scrapers, Motor Grader, Water Tanker

B. Compaction Equipment-Sheep foot Roller, Tamping Roller, Steel Wheel Vibratory Roller, Steel Wheel Static Roller, Pneumatic Roller, Plate compactor/ Rammer

C. Hot Mix Plant Unit-Hot mix plants, Paver Finishers, Tippers, Generating sets, Weigh bridges, Mobile cranes 8/10 tonnes, Loaders, Mobile workshop unit.

D. Building construction machinery-Crane, Concrete mixture, Vibrators, Generators, Concrete batching plant, Air compressor, Core drilling machine, Vibro Hammer, Submersible pump, Centrifugal pump, Hot mix plant3.

20. **AMUR ESTIMATES/MANUFACTURE ESTIMATES:-**

Workshop estimate, Jeep/car estimates, Manufacture Estimates of LCV, Road Roller Estimates, Truck Estimates, Backhoe loader Estimates, Hot mix Plant Estimates.

21. **Layout and Maintenance of Machinery:-**

1. Maintenance servicing and upkeep of machinery, Safety measures /precautions, Condemnation and disposal of equipment and spare parts, Layout of A type workshop, Layout of B type workshops, Layout of c type workshops, Working life of machinery, Rules for issuing sanction for condemnation and disposal, Different batteries and tyre size.

Department Professional Examination for Sub-Divisional Engineers/Assistant Engineers (Electrical) of Haryana PWD B&R

ELECTRICAL ENGINEERING

Syllabus

Module 1: Electric circuits:

DC Network: Electrical circuit elements, active and passive elements, voltage and current sources, concept of linearity, unilateral and bilateral elements, Kirchhoff's laws, Mesh and nodal methods of analysis, Network Theorems, Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorem.

AC Network: Representation of Sinusoidal waveforms-Average and r.m.s values, form and peak factors. Analysis of single-phase AC Circuits consisting R-L-C combination (Series and Parallel) apparent, active & reactive power, Resonance in series and parallel circuits, three phase balanced circuits, voltage and current relations in star and delta connections.

Module 2: Electromagnetic Fields & Magnetic Materials

EM Theory:- Electric Field Intensity, Electric Flux Density, Ampere's Law.

Magnetic Materials: Analogy between electric & magnetic circuits, Magnetomotive force, Reluctance, Magnetic circuits, Self and Mutual Inductance of simple configurations, B-H Curve, Single phase transformer: equivalent circuit, open circuit and short circuit tests, losses and efficiency; Three-phase transformers: connections, Auto-transformer, Volt-Amp- relations, Efficiency, Advantages & Disadvantages, Applications.

Module 3: Electrical Machines and Measuring Instrumentation

Electrical Machines: EMEC principles; DC machines Principle and Construction, Types, EMP equation of generator and torque equation of motor, applications of DC motors, Three phase Induction motor, Principle and construction, Types, Slip-torque characteristics, applications, Single Phase Induction motor Principle of operation and introduction to methods of starting, applications.

Measuring Instrumentation: Type of instruments, construction and working principles of PMMC and moving iron type voltmeters & ammeters, Review of indicating and integrating instruments, measurement of low, medium and high resistances, AC bridges for inductance and capacitance measurement, Current and potential transformer, electronic instruments: Voltmeter, Multi meter, Wattmeter and energy meter.

Module 4: Tariffs, Power factor, Three Phase Power.

Introduction about Power Factor: Causes of low power factor, power factor improvement, calculation of power factor correction, economics of power factor improvement.

Measurement of Three Phase Power: One wattmeter method, two wattmeter method, power factor of a balanced load, variation of wattmeter readings with load power factor, measurement of reactive volt amperes.

Module 5: Power System

Introduction to Power System: General layout of electrical power system and functions of its elements, Concept of Grid, generation, transmissions and distribution system, Classification of lines, Load curve, load duration curve, maximum demand, average load, demand factor, load

factor, diversify factor, capacity factor, utilization factor, installed capacity, base load and peak load plant, Power plants, Plant factors, conventional & Non-conventional sources of energy.

Module 6

Transmission & Distribution of Electric Power: Constants of transmission lines, skin effect, proximity effect, Ferranti effect, Inductance and capacitance of single phase and three phase system, GMD, GMR, Underground cables, configurations of transmission lines, bundled conductors, performance of lines, short, medium and long transmission lines, Sag and tension, effects of wind and ice loading, Overhead line insulators, string efficiency.

Module 7

Electrical Installation in Building work and Plinth Area Rates for Rough Cost Estimate:- Graphical symbols in electrotechnology, Voltage limits for AC system (Low or medium voltage, high voltage, extra high voltage), Types of wiring and size of PVC wires used for various electrical load, Circuit wiring, Sub circuit wiring, Sub main wiring, Plinth area rates for various buildings for preparing rough cost estimate, Raceway, advantage of raceway, Lifespan of electrical appliances.

Module 8

Electrical Earthing and Protection of Building against Lightning:- Electrical earthing, types of earth electrodes, electrical earthing of Transformer, Electrical earthing of DG Set, Size of earth lead for transformer, Types of earth electrodes for (transformer, DG Set, HT panel, LT panel), Testing procedure of electrical earthing, advantages of electrical earthing. Lightning arrester, Principle of protection, Materials used, Size of conductor used below ground.

Module 9

Cables and Electrical Substation:- Selection of cables, Structure of Armoured cable, Factor's depends upon the size selection of cables, Voltage drop calculation. Derating Factor's, Type of faults in cable, Description of type Test and routine test on cables. Single line diagram of 11 KV Substation, Main component of 11 KV Substation, Rising main, Advantage of Rising main, Routine and Type Test on Transformer, LT Electrical Panel, HT Panel.

Module 10

Switchgear Protection System:- Fuse, MCB, MCCB, RCCB, Air Circuit Breaker, Construction working principle of Air Circuit Breaker, Vaccum Circuit breaker, Construction working principle of Vaccum Circuit Breaker, SF6 Circuit breaker, Construction working principle of SF6 Circuit breaker, Breaking capacity, making capacity, Difference between Isolator and Air Circuit Breaker, Bus coupler, Relay , Shunt trip, UVT, Microprocessor relay, Importance of Switchgear system.

Module 11

ELV Services:-Fire Alarm system, CCTV Surveillance system, LAN system, EPABX system, Smart Class Room's, building management system, Audio-Video Conferencing system.

Module 12

Other Services:- Manifold Gas Pipeline System(MGPS) and HVAC system, Solar Power Plant system, Lift and Escalators, DG Set, AMF Panel.

Department Professional Examination for Sub-Divisional Engineers/Assistant Engineers (Electrical) of Haryana PWD B&R

Syllabus

Simple Mechanical Engineering

Basics of Automobiles

Transmission system -Parts of Transmission system, Needs of Transmission system ,Types of Transmission system , Front Wheel Drive, Four Wheel Drive ,Rear Wheel Drive, , Chassis and its components in automobile system, Application of chassis in automobiles, Frame ,Engine ,Clutch ,Gear box , Propeller shaft and Universal Joint, Front axle, Rear axle and Differential , Suspension system , Steering system ,Braking system ,Wheel and tyre ,Different batteries and Electrical system.

Refrigeration & Air Conditioning:-

What is Refrigeration, Compressor, Condenser, Expansion Devices, Evaporator, Refrigerants, Multi Pressure System, Complete Vapour Compression System, Properties of Moist air, Fans, Solar radiations, Refrigeration and air conditioning control system, Design Conditions, Applications.

Machinery used in mechanical workshop for repair and maintenance of vehicles /Machinery

Wheel Alignment & Balancer Machine-Function and Application, Tyre Changing Machine, Air Compressor-Function and Application, Two Post Hydraulic Lift-Function and Application, Pneumatic Impact Wrench-Function and Application, Nitrogen Inflator Machine, Oil Drainer-Function and Application.

Basic Machining Process:-

Introduction of welding, soldering , Brazing, , Metal Forming, Forging , Defects, Rolling, Extrusion or Wire drawing, Casting Process, Die Casting, Lathe Machine-Function, Type & Application, Shapers and planers-Function, Type &Application, Drilling Machines-Function, Type & Application, Milling Process-Function, Type &Application, Grinding Process-Function, Type & Application, Welding Process-Function, Type &Application

Major Construction Equipment Used In Road / Building Construction

Trucks, Tractors, Tractor Trolley, Water Tanker, Inspection Vehicles(Jeep, Vans, Cars), Road maintenance van, Bulk bitumen tankers/distributors, Grit spreaders, Tar boilers/trollies, Road Rollers, Excavator/ Backhoe Loader, Hot Mix Plant.

Amur Estimates/Manufacture Estimates:-

AMUR Estimate for Jeep/Car/ Truck, Manufacture Estimates of LCV / Jeep

Layout and Maintenance of Machinery:-

Maintenance, servicing and upkeep of machinery, Safety measures /precautions, Layout of A type workshop, Layout of B type workshops, Layout of c type workshops, Working life of machinery, Different batteries and tyre size.

Department Professional Examination for Sub-Divisional Engineers/Assistant Engineers (Horticulture) of Haryana PWD B&R

Horticulture Engg-Landscaping & Horticulture

Syllabus

1. Importance & scope of Gardening, ornamental Horticulture, Bioaesthetic planning of public places like Recreational Gardens, Home Gardens, Educational Institutes, Industrial Area, Railway Stations, Bus Terminals, Roadside plantations, River banks, Dam sites, Hydroelectric Stations etc.
2. Principals of Gardening, garden elements, features, and adornments.
   - Gardens styles- Formal, Informal, and free styles. Hindu type gardens, Natural gardens, Wild gardens, Persian gardens, Italians gardens, French gardens, English gardens, Japanese gardens.
   - Special types of Garden-Roof gardens, Sunkan garden, vertical garden, terrace garden, water garden, Bog garden, shade garden, rockery garden, Terrarium, bottle garden, window garden.
3. Types of gardens- Formal and informal
4. Basic Components and features of landscaping gardening: Plant Components and Non Plant Components.
5. Classification of Ornamental plants based on their utilities, lifestyle, growth habits etc.
6. Significance & utility of various plants groups in landscaping.
7. Landscape designing for various situations like Home gardens, recreational gardens, children's park, Educational institutions, Public places, Industrial areas, Railway stations, Bus terminals, Airports, Dam sites, Hydroelectric stations, river/canal banks etc.
8. Pot culture, various types of pots and containers.
9. Interior Scaping. Potted foliage plants, window garden, terrarium, bottle and dish gardens, vertical gardens, hanging baskets, maintenance of indoor plants.
10. Lawns: Lawn grasses, establishment & maintenance of Lawns for playground, parks.
11. Organic manures, fertilisers, bio fertilizers major and minor elements.
12. Propagation of plants and nursery management.
13. Transplantation, training, and pruning, after care of plants.
14. Importance of water and different irrigation system used for watering lawns, plants, and gardens.
15. Miniature landscape and Bonsai Styles, plants, containers & tools, Cultural practices, special practices, care & maintenance.
16. Flower arrangements: Principles & styles, value addition in flowers.
17. Description of trees, shrubs & shrubbery, Edges & Hedges, flowering annuals, bulbous ornamentals, climbers, creepers, palms, ferns, cycads, ornamentals grasses, cacti, succulents, indoor plants, foliage plants & water plants.
18. Designing of garden structures: flower boarders, Flower beds, arboretum, rosary, fernery, Palmatum, carpet garden, Arches, Bowers, Pergolas, Roads, Walks, Paths, Bridges, Fountain & Statues.

19. Designing & layout of Garden: House garden, Road site planting, garden in Industrial areas. Layout of terrarium/Bottle garden, Dish garden.
20. Lawn Establishment: Preparation of land & Planting, Designing & layout of rockery, water garden, terrace garden, Roof Garden.
21. Dry flower making & bouquet making.
22. Seasonal plants, Annual & Perianal plants & trees.
23. Description of various disease, insect, pest, and weed management in horticulture, Types of pesticides, and methods of their use.
24. Description of various tools and machinery used in Horticulture.
25. Discussion on recent advances in the field of Horticulture.

Departmental Professional Examination for Sub Divisional Engineers/Assistant Engineers (Mechanical/ Electrical/ Civil/ Horticulture) of Haryana P.W.D. (B & R)

Syllabus

Paper-Accounts and Office Procedure

Part-1 (P.W.D. Code-2009)

Detailed Estimates, Rough Cost Estimate, Administrative approval, Inviting Tenders, Item Rate Contract, Labour Rate Contract, Acceptance of Tenders, Advances to Contractor, Agreement, Analysis of Rates (Break up of Rates), Anticipatory Sanction, Approving Single Tender, Validity of bid, Bank Guarantee, BONUS in relation to Work, BOT Annuity contract, BOT Contract, EPC Contracts (Engineering procurement & commissioning), Breach of Contract, Build Own Operate and Transfer (BOOT), Build-Lease and Transfer (BLT), Build-Own and Operate (BOO), Deposit works, Major Works, Minor Works, Check Measurement, Standard Measurement Book, Circle, Citizen Information Board, Classification of Work, Competent Authority, Completion Plans, Completion Report, Composite Contract System, Contract, Contract Document, Contract Price, Day Work. Defect Liability Certificate, Defect Liability Period, D.N.I.T, Letter of Acceptance (LOA), Notice to proceed (NTP), Collector Labour Rate, Departmental Execution of Work, Muster Rolls, work order, Disposal of Stores, Division, Earnest Money (Bid Security), Emergency Works, Estimate, Estimate of cost of Work, E-tendering, Execution of Petty Work, Duties of Executive Engineer, Duties of Superintending Engineer, Duties of Accounts, Final Account Statement/Bill, Financial Close, Measures to prevent Heavy Expenditure in March, Land Acquisition Account, Lapse of Sanction, Letter of Credit, Levy of Compensation, Liquidated, Arbitration.

Damages, Loss of Cash, Lump-sum Contract, Machinery Advance, Maintenance Contract, Maintenance of Measurement Book, Major Estimate, Mobilisation Advance, Negotiation with Contractor, Non Schedule Items, Non Schedule Rates, Notice Inviting Tender, Operate-Maintain and Transfer (OMT), Outsourcing, Owner of Land from whom land is acquired. Percentage Contract, Percentage Rate Tender, Performance Security, Petty Works, Physical Verification of Stores, Piece Work, PPP Mode (Public Private Participation), Pre Bid Conference. (Meeting), Preliminary Estimate Private Works, Protective Work(s), Reserve Stock Limit/Stock Limit, Re-tendering, Retention Money (Security Deposit), Revised Estimate, Rough Cost Estimate, Rules if lowest tenderer back out, Rush of Expenditure, Schedule Contract, Schedule of Rates, Scope of Sanction, Section, Secured Advance, Security Deposit, Single Tender Acceptance, Sponsored Works, Stores, Sub-Contracting, Sub Division, Supplementary Estimate, Surplus Stores, Technical Sanction, Tender, Time Based Contract, Turnkey Contract, Types of Contracts, Unserviceable stores, Work at Risk and cost of contractor.

Advance payment, Secured Advance, Capital Expenditure, Revenue Expenditure, Contract, Work orders, Employment on Muster Roll, Original Work Repair Work, Original Work, Deposit Work, Store Issue Rate, Detailed measurements may be dispensed with in the case of periodical repairs of buildings when the quantities are recorded in efficiency maintained standard measurement books, Loss of MB is a serious matter and shall be reported to the higher Authorities, Employment on Muster Roll, Normal Works, Tender Document, Hiring private Buildings for office purpose, Submission, Receipt und processing of tenders, Acceptance of tenders, Role of Department of Architecture, Employment on Muster Roll Approval of estimates Introduction, Office procedure and miscellaneous as per PWD Code, 2009, Duties and responsibilities of Officer as per PWD Cade-2009, Estimates and Projects, Quality control, Assurance and audit, Store and Procurement of Material, Execution of works, Inspection.

Part-II (Miscellaneous)

Writing of cashbook with example, Contractor Bill, Abbreviations used on P.W.D. accounts, Objective type question from Haryana P.W.D. accounts, Objective type question from Haryana PWD Code-2009/DFR/PFR Volume/Account Code-Volume-III/STR Volume-I, Indian Forest Act-1927 and its latest instruction, Policy for Purchase of land voluntarily offered to the Government for development of projects by Haryana Government Notification on 06.02.2017 and its latest instruction, The land Acquisition rehabilitation and resettlement Act-2013, Haryana Road Infrastructure Protection Act-2017 and its latest instruction. Registration Rules for Contractor-2021, Common Bidding Document (Haryana Engineering Works Portal), B&R Manual of Orders, Manual of Orders, RTI/Court cases, Arbitration Act, E-office, online process of Estimate, Redressal of grievances of General Public (Jan Samwad, CM Window, PG Gram, E-Samadhaan etc.), Grievances of Office Staff etc.