

SYLLABUS FOR THE PROFESSIONAL EXAMINATION OF ASSISTANT ENGINEERS  
AND DEPUTY ENGINEERS

PAPER I

*General (Civil Engineering)*

Part —(I) Material (II) Construction and (III) Management of works.

PART I

*Materials*

(a) *Stones*.—General characteristics of building stones. Chief varieties and uses. Quarrying, blasting, dressing, tools use—strength—causes of decay and methods of preservation. Tests—artificial stone—manufacture and use—costs.

(b) *Bricks and tiles*.—General characteristics, varieties and uses, manufacture selecting clay, moulding and burning in kiln (Bullu's and Hofman's kilns), causes of decay and method of preservation. Strength—essentials of good bricks, tests, Mangalore and country tiles, salt glazed pipes and china-clay-ware—Terra cotta and refractory materials. Costs.

(c) *Glass*.—General characteristics, varieties, composition, manufacture and uses—costs.

(d) *Plastics*.—Composition, chief varieties, properties and uses. Costs.

(e) *Celluloid, bakelite, ebonite, vitrolite, marbarite, etc.*

(f) *Limes and cements*.—

*Limes*.—Hydraulic and fat. Occurrence, collection, burning, stacking and storing. Artificial hydraulic limes. Gypsum, plaster of paris, Properties and uses. Test—costs.

*Cements*.—Composition and manufacture—storing, varieties and uses. Normal and rapid hardening cements. Aluminous cements. Properties and B. S. S. tests—costs.

(g) *Mortars*.—

*Lime mortars*.—Composition, use of sand and surkhi—Preparation, mixing and grinding, storing, uses, properties, strength and tests—costs.

*Cement mortars*.—Composition, preparation and use. Properties, strength and tests. Gauged mortars—proportioning of materials in mortars. Effect of water content in mortars—costs.

*Mud mortars*.

(h) *Concrete*.—

*Lime Concrete*.—Composition, preparation and use. Properties and strength. Tests—costs.

*Cement concrete.*

*Constituents.*—Aggregate (course and fine). Cement and water. Proportioning and mixing. Real, nominal and field mixes. Bulking of sand. Grading of aggregates. Water cement ratio. Placing and curing. Properties—strength of various mixes and uses. Tests. Water-proofing and surface treatment. Costs. Different grades and their proportion.

(i) *Timber.*—*Wood* : Growth of trees—faults—felling : sapwood and hardwood—methods of sawing and seasoning. Defects in timber. Deteriorating agents and decay of timber. Preservation of timber.

Varieties and uses of important Indian timbers. Characteristics of good timber. Strength of timber. Tests of timber. Costs. Reconstructed wood—plywood and pressed woods. Manufacture, properties and uses. Proprietary timber used for sound and thermal insulation.

(j) *Metals and Alloys.*—

*Cast-iron* : Composition, manufacture, characteristics and uses.

*Wrought-iron* : Composition, manufacture, characteristics and uses.

*Steel* : Characteristics and uses of mild steels, hard steels, alloy steels, such as manganese, nickle, chromium, tungsten and silicon steels, stainless steels and tool steels.

*Non-ferrous metals* : Properties and structural uses of copper, zinc, lead, tin, aluminium and silver.

*Alloys* : Composition, properties uses of brasses, bronzes, white metals, anti-friction bearing metals and other principal alloys.

*Metallic Products* : Pipes, tubes. Plane and corrugated iron sheets, rolled steels sections, cast-iron and steel castings. Costs.

(k) *Preservatives.*—Composition, preparation, properties and tests and uses of paints, polishes, varnishes, distempers and oils and pigment. Costs

(l) *Miscellaneous* :—

(i) *Fuels for power* : Coal, coke, diesel, petroleum, gas, etc. Costs.

(ii) *Carbonaceous and cementing materials* :—

Asphalt and bitumen, natural and artificial, asphaltic products. Properties and uses and costs.

(iii) *Asbestos and asbestos products.* Properties and uses.

(iv) *Rubber, leather, felt, coir and their products.* Properties and uses.

(v) *Soils and soil stablisation and equipment for testing soils.*



✓ PART II

Construction (General)

(i) General principles of designing foundations. Types of soils and safe bearing pressures on the various types of soils. Various types of foundation suitable for various circumstances e. g., open foundations, black-soil foundations, raft foundations, pile foundations, well foundations, grillage foundations, etc.

(ii) Masonry (various types).

(iii) Roofs (various types).

(iv) Scaffolding, centering, and form works different types, steel and wooden moving forms—design for centering for arches and domes tunnel lining and reservoirs, etc. Removal of forms—periods and methods.

(v) Drafting specifications for various items in construction. Points to be borne in mind while drafting specifications.

(vi) Analysis of rates and schedule or rates.

(vii) Minimum Wages Act, as it applies to the analysis of rates.

PART III

✓ Management of works

(i) System of execution of works—departmental agency, piece-work system, contract system. Various types of contract agreements. General conditions of contract agreements, relation with contractors, enforcing contract conditions.

(ii) Measures for the welfare of labour on work-site.

(iii) Compensation under the Workmen's Compensation Act and rules thereunder.

(iv) Sanitary and water-supply arrangement including public health arrangements on large and small works of various categories, e.g., buildings, roads and irrigation projects, etc.

(v) Management and organisation of scarcity works.

(vi) Organisational set up for execution of large work through.—

(a) departmental labour system,

(b) piece-work system and

(c) contract system.

(vii) Precautions about storing and use of explosives, precautions against accidents on large works.

- (viii) Planning watching progress of work.
- (ix) Stores and workshops.
- (x) Communications as pertaining to large projects.
- (xi) Co-ordination of different branches established for the execution of big projects.
- (xii) Statistics about labour employment.
- (xiii) Acquisition and requisition of lands and houses; and rehabilitation of displaced persons, e.g., for villages going under water due to construction of reservoirs, etc.
- (xiv) Residential accommodation for different kinds of establishments as well as labour camps.
- (xv) Transport. — Requirement, organisation, various types, legal aspects.
- (xvi) Organisational set up for highly mechanised jobs.

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SYLLABUS FOR THE PROFESSIONAL EXAMINATION OF MECHANICAL ASSISTANT ENGINEERS AND DEPUTY ENGINEERS

PART I

*General (mechanical engineering)*

1. Standard weights and measures of engineering materials required in mechanical field with their fundamental properties. Special attention to metric system.
2. Various types of precision instruments and gauges with their uses.
3. Lifting equipments and their uses.
4. Various types of power transmission systems and their direct application with advantages and disadvantages.
5. Welding, soldering and brazing, heat treatment.
6. Tools in tool room and their application.
7. Various methods of speed governing in case of oil engines.
8. Various methods of water cooling adopted for oil engines.
9. Lubrication and servicing of automobile units.
10. Schedule of servicing.
11. Valuation of machinery.
12. Layout of machinery and erection of the same.
13. Various types of motive powers (compressed, air combustion engines, electricity, gas, steam). Their various advantages and disadvantages.
14. Commercial correspondence.
15. Battery repair, charging and servicing.

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SYLLABUS FOR THE PROFESSIONAL EXAMINATION OF ASSISTANT  
ENGINEERS AND DEPUTY ENGINEERS

PAPER II ✓

*Special subject—Construction and maintenance of  
lift irrigation schemes.*

1. Preliminary investigation for site, gauging discharges, collection of hydraulic data, fixing H.F.L. Analysis of water for suitability, various salts and their permissibility for seasonal or perennial irrigation, location for infiltration galleries.
2. Lifting devices, e.g., pumps, oil or electric, their relative use and economy, calculations for B.H.P., approximate costing, materials required for running and running cost.
3. *Crop planning.*—Distribution of water, construction of channels, and water courses including design.
4. Auxiliary structures like engine house, pump well, delivery chamber, etc. Their design and construction.
5. Measurement of supply various devices—their description and use.
6. Determination of water rates, and considerations for economic use of water.
7. Maintenance of the schemes.
8. Procedure to be followed in admitting such schemes and declaring the feasibility thereof.

SYLLABUS FOR THE PROFESSIONAL EXAMINATION OF ASSISTANT  
ENGINEERS AND DEPUTY ENGINEERS

PAPER II ✓

*Special subject—Water-supply and sanitary engineering.*

I. *Water-supply—*

A. *Sources of water supply.*—(a) *Ground water.*—Occurrence of ground water, water bearing formations, springs, development of springs, wells, different types of wells, specific capacity of wells, interference of wells. Quality of ground water. Problems related to construction of wells. Infiltration wells and galleries.

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(b) *Surface water.*—Rainfall and run-off. Study of frequency and intensity of rainfall. Measurement of rainfall. Run-off co-efficients and classification of catchments. Rainfall run-off relations. Stream flow studies, flood flow estimates. Work connected with intakes from perennial rivers. Dams and impounding reservoirs. Purpose, materials and construction, capacity of storage required; foundations, spillways, various types of dams and design requirements. Construction problems of dams, intakes. Quality of surface water.

B. *Treatment of water.*—Sanitary survey of water source.

Analysis chemical and bacteriological of water. Interpretation of water analysis and requirement of treatment of water.

(a) *Aeration of water.* Necessity and types of aerations.

(b) *Sedimentation of water.*—Process, period of detention, design of tanks, velocity of flow, inlets and outlets, sludge removal, etc., different types of settling tanks.

(c) *Coagulation.*—Necessity. Different coagulants and the chemical reactions. Design of tanks, methods of application of coagulants, storage of coagulants, properties and care of coagulants. Costs of coagulants and normal dosages applied.

Necessity of flocculation. Different arrangements for flocculation. Design of flocculator tanks.

(d) *Filtration of water.*—Theory of necessity of filtration. Different types of filters. Design of filtration plants. Comparison of various types of filters. Details of various types of filtration plant. Rate of filtration, capacity of filter unit, size of filtering media, under drainage system, methods of cleaning filter media, wash other water gutter, inlet and outlet arrangement for filters; fixtures connected with filtration plants, loss of head through filters, maintenance of filters and treatment plants.

(e) *Other special methods of water treatment.*—Water softening purpose, hardness and types of method for water softening and process adopted and chemicals and materials used for.

Iron removal, manganese removal, tests and odour control, removal of fluorides, removal of colour, use of activated carbon.

C. *Distribution of water.*—Types of supply. Intermittant and continuous—Materials for pipes, etc. Pipes and other fixtures on distribution system and purpose of each, viz., sluice valves, air valves, non-return valves, pressure regulating valves, fire hydrants, etc. Types of distribution system design of pipes, flow in pipes, classification of pipes, laying of pipe lines, joining of pipes and materials required, testing of pipe lines, disinfection of new mains, Corrosion control of pipes. Balancing and service reservoirs—capacities of reservoir required, design of reservoirs, location.

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Waste surveys and prevention of waste in distribution of water, location of leaks, leakages in pipe line, service pipes and connections, pressure tests flushing of mains.

D. *Pumps and pumping stations.*—Necessity of pumping and pumping stations. Location and design of types of pumps and purpose of each. Work and efficiency of pumps. Choice of prime movers. Efficiencies of different prime movers. Stand-by for pumping machineries. Maintenance of pumping machineries. Operating schedule of pumping stations.

E. *Disinfection of water supply.*—Need and importance of disinfection. Different processes of disinfection and apparatus used for the process. Cost of chemicals used. Point of application—Disinfection of large distribution systems.

F. *Management of water works.*—Financial implications of water works. Public health engineering importance of protected water supplies. Economic of a water-supply. Watering and methods of revenue collections. Financial forecasts. Costs of various treatment work.

Plant laboratory control of quality of water. Measurement of quality of water at water works.

Preparation of water-supply project.

## II. *Sewerage*—

A. *Definitions.*—Different types of drainage systems, Separate combined and partial system, surface drain, design and adaptability of surface drains. Amount of storm water, the rational method. Design of layout of drains. Necessity of detailed surveys.

B. *Materials for sewer pipes, flow in sewers.* The hydraulic grade line, self-cleansing velocities, flow diagrams, sewer shapes.

Sewer appurtenances, manholes, inlets, catch-basin, flushing devices, various types of traps junctions of sewers, sewers, sewer crossings, syphons.

C. *Sewer Constructions.*—Lines and grades, pipe laying and jointing testing of sewers, maintenance of sewers, cleansing of sewers and equipment required for.

Ejectors, sewage pumping stations, design and location, pumping machinery and design of capacities.

D. *Treatment of Sewage.*—Primary treatment, Racks and screens, types and location. Maintenance of racks, amount of disposal of screenings, grit chambers, design requirements of grit chamber, quantity and disposal of grit.



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Sedimentation of sewage.

Clariflocculators and settling tanks. Design consideration inlets and outlets, velocities, collection and disposal of sludge, maintenance of these, use of chemicals for settlement.

Secondary treatment of sewage.

Activated sludge process, different types, steps in the process, detention period, method of aeration, return sludge, control of the process, characteristics of the process, sludge disposal.

Trickling filters. Various types of filtration methods used in sewage treatment, adaptability and efficiency of each method, details of trickling filters, filtering material, rate of filtration, construction of filters underdrainage, inlet and outlet, method of dosing, operation and maintenance, bio-filtration and recirculation.

Chemical precipitation of sewage, chlorination, disinfection, sludge disposal, drying beds.

E. *Disposal of sewage and effluent.*—Dilution in sea and rivers, factor affecting, dissolved oxygen and regeneration of streams. Disposal on land irrigation, sewage effluent farms, selection of sites for location of disposal works and farms.

F. *Management.*—Financing of sewage scheme, public health engineering importance, maintenance of sewers and disposal works.

G. Individual house sewage disposal :—

Septic tanks, design and requirements. Sanitary latrines, aqua privies and other types of latrines with their design and requirements.

Collection and disposal of sewage in unsewered areas.

H. Treatment and disposal of trade wastes, necessity for general methods, for problems of steam pollution.

Preparation of projects for sewage scheme.

III. *General sanitary engineering.*—General weights of pipes for water-supply and drainage and quantities of jointing materials required. Transport of such materials and carrying capacities of normal vehicles.

Sanitary requirements of slaughter-houses and schools. Importance of town planning from public health point of view, sanitation of swimming pools, refuse collection and disposal plumbing, industrial hygiene.

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(c) Jetties.—General principles of layout and designs—design of R. C. C. superstructure; Types of fenders and their functions—dolphins.

(d) Designs and construction of dock walls.—R. C. C. and masonry dock walls, R. C. C. and steel sheet pile walls, R.C.C. counterforts, cantilever walls; stability calculations.

(e) Docks and locks.—Elementary principles of designs and layout of wet and dry docks; slipway; floating docks, lock and lock-gates, dock bridges.

(f) Break water.—Classifications of break waters; alignment; design and construction of break waters; failure of break water.

(g) Port yards, warehouses and transit sheds.—Layout of port yards including roads, stacking platforms, railway and crane rails layout of godowns and open sheds. Their types and construction details.

(h) Port and workshop machinery.—General knowledge of port machinery, mechanical handling plants and workshops machinery.

(i) Inland water transport.—Development of creeks and rivers.

SYLLABUS FOR THE PROFESSIONAL EXAMINATION OF ASSISTANT  
ENGINEERS AND DEPUTY ENGINEERS

PAPER III

*Accounts*

Accounts and rules of the Public Works and I Departments syllabus therefor being as under :—

I. Introduction to the Indian Government Accounts and Audit.

Part I—Chapter 1.

Part II—Chapters 9 and 11.

Part III—Chapters 12, 13, 15 17 and 21.

Part IV—Chapters 29, 30, 31 and 35.

Part V—Chapter 37.

II. Maharashtra Public Works Account Code and the Maharashtra Public Works Manual—Whole.

III. Labour Laws :—

(a) The Industrial Disputes Act, 1947 and the rules framed thereunder.

(b) The Minimum Wages Act, 1948 and the rules framed thereunder.

(c) The Workmen's Compensation Act, 1923 and the rules made thereunder.

~~Notes—The officers appearing at the examinations should be allowed to have books for subjects under I of the syllabus during the Examinations.~~

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SYLLABUS FOR THE PROFESSIONAL EXAMINATION OF  
DEPUTY ENGINEERS (CIVIL)

PAPER IV

*Practical test—One Paper*

A practical test in the use and adjustment of levelling instruments and theodolite, etc., and in lining out of work.

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SYLLABUS FOR THE PROFESSIONAL EXAMINATION OF  
DEPUTY ENGINEER (MAECHANICAL)

*Practical test—One Paper*

1. Explaining the function of precision machine tools and using micrometers, surface gauges, depth gauges, etc.

2. Marking the jobs.

3. Fixing a job in a 4-jaw chuck and turning to size on a lathe.

4. Explaining the various ways in which jobs are fixed on various machine tools and how the machines operate.

5. Naming various important parts of machines and stating use of each.

6. Checking up the crankshaft alignment of an oil engine.

cc 7. Tracing various circuits on oil-engine, e.g., fuel circuit, lubricating oil circuit, cooling water circuit, air circuit, battery system etc.

8. Explain, in brief, function of following with small neat sketches drawn on the spots: fuel pump, automiser, governor, battery, oil filters, etc.

9. Explain how machines like tractors, road roller, dumpers, air compressors, generators, will be tested for a trial running test and actually starting of one of them.

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SYLLABUS FOR THE PROFESSIONAL EXAMINATION OF ENGINEERING  
OFFICERS IN THE PORTS ORGANISATION

*Practical test—One Paper*

A practical test in the use and adjustment of levelling instruments, theodolite sextant, Invas base, etc., and in alignment of work.

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