SYLLABUS FOR CIVIL ENGINEERING WRITTEN EXAMINATION FOR THE RECRUITMENT TO THE POST OF JUNIOR ENGINEER IN PMGSY CELL OF PWD (ROADS)

1. Building Materials

Timber : Different types and species of structural timber, density-moisture relationship, strength in different directions, defects, influence of defects on permissible stress, preservation, dry and wet rots, codal provisions for design, Plywood.

Bricks: Types, Indian Standard classification, absorption, saturation factor, strength in masonry, influence of mortar strength on masonry strength.

Cement : Compounds of, different types, setting times, strength.

Cement Mortar : Ingredients, proposition, water demand, mortars for plastering and masonry.

Concrete : Importance of W/C Ratio, Strength, ingredients including admixtures, workability, 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 sketal frames – moments distribution, slope-deflection, stiffness and force methods, energy methods, Muller-Breslau principle and application.
Plastic analysis of indeterminate beams and simple frames – shape factors.

3. DESIGN OF STEEL STRUCTURES

Principles of working stress method. Design of connections, simple members, Built-up sections and frames, Design of Industrial roof. Principles of ultimate load design. Design of simple members and frames.

4. DESIGN OF CONCRETE AND MASONRY STRUCTURES

Limit state design for bending, shear, axial compression and combined forces. Codal provisions for slabs, beams, walls and footings. Working stress methods of design of R.C. members.
Principles of prestressed concrete design, materials, methods of prestressing, losses. Design of simple members and determinate structures. Introductions to prestressing of indeterminate structures.

5. CONSTRUCTION PRACTICE, PLANNING AND MANAGEMENT

Concreting Equipment : Weight Batcher, Mixer, Vibrator, batching plant, concrete pump, Cranes, hoist, lifting equipment.

Earthwork Equipment: Power shovel, hoe, dozer, dumper, trailers and tractor, rollers, sheep foot rollers, pump

Construction, Planning and Management : Bar chart, linked bar chart, work break down structures, Activity – on – arrow diagrams. Critical path, probabilistic activity durations; Event based networks.

6. (a) FLUID MECHANICS, OPEN CHANNEL FLOW, PIPE FLOW:

Fluid Properties, Pressure, Thrust, Buoyancy; Flow Kinematics; Integration of flow equations; Flow measurement; Relative motion; Movement of momentum; Viscosity, Boundary layer and Control, Drag, Lift; dimensional Analysis, Modeling; Cavitation; Flow oscillations; Momentum and Energy principles in Open channel flow, Flow controls, Hydraulic jump, Flow sections and properties; Normal flow, Gradually varied flow; Surges; Flow development and losses in pipe flow, Measurements; Siphons; Surges and Water hammer, Delivery of Power Pipe networks.

7. (a) HYDROLOGY : Hydrological cycle, precipitation and related data analyses, PMP, unit and synthetic hydrographs; Evaporation and transpiration; Floods and their management, PMP; Streams and their gauging, River morphology, Routing of floods; Capacity of Reservoirs.

(b) WATER RESOURCES ENGINEERING : Water resources of the globe: Multipurpose users of Water. Soil-Plant-Water relationship, irrigation systems, water demand assessment; Storages and their yields, ground water yield and well hydraulics; Waterlogging, drainage and design; Irrigation revenue; design of rigid boundary canals. Lacey's and Tractive force concepts in canal design, lining of canals; Sediment transport in canals; Non-Overflow and overflow sections of gravity dams and their design, Energy dissipaters and tail water rating; Design of headworks, distribution works, falls cross-drainage works, outlets; River training.

8. ENVIRONMENTAL ENGINEERING

(a) WATER SUPPLY ENGINEERING : Sources of supply, yields, design of intakes and conductors; Estimation of demand; Water quality standards; Control of Water-borne diseases; Primary and secondary treatment, detailing and maintenance of treatment units; Conveyance and distribution system of treated water, leakages and control; Rural water supply; Institutional and industrial water supply.

(b) WASTE WATER ENGINEERING : Urban rain water disposal; System of sewage collection and disposal; Design of sewers and sewerage system; pumping, Characteristics of sewage and its treatment, Disposal of products of sewage treatment, stream flow and rejuvenation Industrial and industrial sewage management; Plumbing System; Rural and semi-urban sanitation.

9. (a) SOIL MECHANICS : Properties of soils, classification and interrelationship; Compaction behavior, methods of compaction and their choice; Permeability and seepage, flow nets, Inverted filters; Compressibility and consolidation; Shearing resistance, stresses and failure; soil testing in laboratory and in-situ; Stress path and applications; Earth pressure theories, stress distribution in soil; soil exploration, samplers, load tests, penetration tests.

(b) FOUNDATION ENGINEERING : Types of foundations, Selection criteria, bearing capacity, settlement, laboratory and field test; Types of piles and their design and layout, Foundations on expansive soil, swelling and its prevention, foundation on swelling soils.

10. (a) SURVEYING : Classification of surveys, scales, accuracy, Measurement of distances – direct and indirect methods; optical and electronic devices; Measurement of directions, prismatic and compass, local attraction; Theodolites – types; Measurement of elevations – Spirit and trigonometric leveling .

(b) TRANSPORTATION ENGINEERTING : Planning of highway systems, alignment and geometric design, horizontal and vertical curves, grade separation; Materials and construction methods for different surfaces and maintenance: Principles of pavement design; Drainage. Traffic surveys, Intersections, signaling: Mass transit system, accessibility, networking.