



Public Service Commission, West Bengal  
161A, S. P. Mukherjee Road, Kolkata -700 026

**SCREENING TEST FOR RECRUITMENT TO THE POST OF DEPUTY DIRECTOR (ENGINEERING) IN  
RIVER RESEARCH INSTITUTE UNDER THE IRRIGATION & WATERWAYS DEPARTMENT, GOVT. OF  
W.B. VIDE ADVT. NO. 08/2022.**

Scheme

1. Type of examination: - MCQ type test. The test will consist of questions on Civil Engineering as well as English & General Awareness.
2. No. of questions: - 100 [30 questions on English & General Awareness and 70 questions on Civil Engineering- each question carrying equal marks]
3. Full Marks: - 100 

{	English – 20 Marks	}
General Awareness- 10 Marks		
Civil Engineering - 70 Marks		

  
[1/3 mark will be deducted for each wrong answer]
4. Duration: - 1 hour and 30 minutes

By order of the Commission

**Syllabus of CIVIL ENGINEERING for the Screening Test for  
recruitment to the post of DEPUTY DIRECTOR (ENGINEERING) in  
River Research Institute under the Irrigation & Waterways  
Department, Govt. of W. B. [Advt. No. 08/2022].**

**A. *Fluid Mechanics and Hydraulics* :**

Fluid properties and definitions, Flow kinematics, continuation momentum and energy equations applicable to fluid flow. Bernouli's theorem, flow through conduits, flow through open channels, Hydraulic jump, flow through pipes and losses in pipe flows, siphons, pipe network, forces in pipe end, hydraulics energy grade line, water hammer. Viscosity, definition of ideal fluid. Buckingham Pi-theorem, Reynolds Number, Froude Number, Euler Number, Weber Number, Mach Number etc.

**B. *Soil Mechanics and Foundation Engineering*:**

Properties of soils, classifications and interrelationship, definitions of terms used, soil testing in laboratory and in-situ, compaction behavior, methods of compaction and their choice, permeability and seepage, flow nets, flow under high hydraulic structure, uplift and quick sand condition, inverted filters, unconfined and direct shear stress, triaxial test, shearing resistance, Earth pressure theories, stability of slopes,



compressibility and consolidation.

**c. Survey**

1. Classification of surveys, scales, accuracy, measurement of distances by direct and indirect methods, optical and electronic devices, Measurement of directions, prismatic compass, local attractions. Theodolites-types, Measurement of elevations, trigonometric levelling, contours, Establishment of control by triangulations and traversing. Measurements and adjustment of observation, computation of co-ordinates, Errors and their corrections of measurements of length, bearing horizontal and vertical angles and levelling operation, correction due to refraction and curvatures, Map preparation by plane tabling and photogrammetry (Definitions and Development of Photogrammetry, Classifications of Photogrammetry, Uses of Photogrammetry). Map substitutes, setting out directions and grades, types of curves, setting out of curves and excavation lines for building foundation. Hydrographic survey of Rivers and Reservoirs. Basic knowledge of Digital Level, Total Station, RTK (Real-Time Kinematic), DGPS (Differential Global Positioning System) and ADCP (Acoustic Doppler Current Profiler).

**2. Basic Knowledge of GPS, Remote Sensing and Geographical Information System.**

GPS point positioning, GPS relative positioning; RTK GPS, Factors affecting GPS accuracy. Gridded and LiDAR elevation data, vector data and synthetic aperture radar (SAR) data. Data portals, different platforms used for Earth observation. Supervised and unsupervised classification. Basic Statistics including hypothesis testing, Correlation Analysis, Regression Analysis etc. DBMS (Database Management Systems) and application of DBMS in GIS; data management using MS-Excel. Spatial data models – Raster and vector. Overlay analysis, Digital Terrain Analysis and Modelling- TIN (Triangular Irregular Network) and DEM (Digital Elevation Model).

**D. WATER RESOURCES ENGINEERING:**

1. **Hydrology** – Hydrological cycle, Measurements, Pan-evapoartion; wind rose diagram, computations and statistics, Run off and stream flow, Flood routing, measuring techniques and computations, Hydrographs, computations and interpretation, water availability, study of barrage and dam, area elevation curve; guide

curve of dam and barrage, ground water, Estimation, Measurements, Characteristics. Ground Water Hydrology and Water Conservation

2. **Irrigation Engineering** – Types of irrigation systems and their detail description, soil-water-crop relationship, Types of soils, water requirement of crops, Delta and duty.

Classification of rivers, fluvial hydraulics, tidal cycle, River Theory, Effect of dams on river regime; water training works;

Irrigation channels; Design principles of irrigation canals, Drainage channels and Navigation canals; canal linings and canal outlets.

3. **Hydraulic structures** – Storage Reservoirs; Different types of dams and their design principles; saline embankments, weirs, barrages, dams, spurs, sea wall, bed bars, launching apron and their design principles; spillways, Energy dissipation by hydraulic jump, different types of energy dissipation. Headworks; cross drainage works; Falls and Regulators; rehabilitation of Barrages and Dams. Ports, docks and harbours.

#### E. *Physical and Mathematical Modelling of River Systems and Coastal Stretches*

##### 1. **Physical Modelling:**

Steady flow, Unsteady flow, Gradually Varied flow, Rapidly Varied flow Basic principles of physical hydraulic model (Geometric, Kinematic and Dynamic similitude), Dimensional Analysis, dimensionless parameter, Dynamic Similitude between Physical scale-down model and prototype, Distorted model, tilted model, scale effect. Dimensionless grain diameter, Skin friction and form drag, Manning- Strickler resistance, Shield's parameter, Computation of Mannings's 'n'.

The physical properties of sediment and transport processes. Topics will include grain size classification, settling velocity, density of deposited material, transport processes, deposition, erosion and compaction. Mobile bed modelling, Fixed bed vs mobile bed modelling, Drop structures, local scour, erosion below spillways, sills, locks and dams, reservoir sedimentation, etc.

##### 2. **Mathematical Modelling:**

Basic concept of Computational Fluid Dynamics (CFD), Navier-Stokes's equation, Euler's equation, 1D/2D Diffusion Wave Equation, Saint Venant's Shallow Water Equation. Discretization of time by Implicit & Explicit



methods and space by Finite Difference, Finite Element and Finite Volume method. Overview of some application software like HECRAS/MIKE/QGIS/ ArcGIS. How to obtain terrain data from multiple sources and combine with channel data to make a model.

F. ***Construction Materials, Practices, Planning and Management***

1. Building Materials specifications, tests, uses and Codal provisions.

Concrete technology – Cement it's properties, classification and specification – provisions in I. S. Code. Properties of course and fine aggregates – provisions in I. S. Code, concrete mix design, Laboratory concrete, Ready mixed concrete, field tests for quality control of concrete, concreting equipments.