

**ANNEXURE-III****SCHEME AND SYLLABUS FOR THE POST OF ASSISTANT HYDROLOGIST IN GROUND WATER DEPARTMENT****SCHEME OF EXAMINATION**

<b>Part: A: WRITTEN EXAMINATION (Objective Type)</b>	<b>No.of Questions</b>	<b>Duration (Minutes)</b>	<b>Maximum Marks</b>
<b>Paper-I:</b> General Studies And General Abilities	150	150	150
<b>Paper-II:</b> Water Resources	150	150	300
<b>Part: B: Interview</b>			50
		<b>Total</b>	<b>500</b>

**SYLLABUS****Paper-I: GENERAL STUDIES AND GENERAL ABILITIES**

1. Current affairs – Regional, National and International.
2. International Relations and Events.
3. General Science; India's Achievements in Science and Technology.
4. Environmental issues; Disaster Management- Prevention and Mitigation Strategies.
5. Economic and Social Development of India and Telangana.
6. Physical, Social and Economic Geography of India.
7. Physical, Social and Economic Geography and Demography of Telangana.
8. Socio-economic, Political and Cultural History of Modern India with special emphasis on Indian National Movement.
9. Socio-economic, Political and Cultural History of Telangana with special emphasis on Telangana Statehood Movement and formation of Telangana state.
10. Indian Constitution; Indian Political System; Governance and Public Policy.
11. Social Exclusion; Rights issues such as Gender, Caste, Tribe, Disability etc. and inclusive policies.
12. Society, Culture, Heritage, Arts and Literature of Telangana.
13. Policies of Telangana State.
14. Logical Reasoning; Analytical Ability and Data Interpretation.
15. Basic English. (10<sup>th</sup> Class Standard)

## PAPER-II WATER RESOURCES

### **Unit-1 General Geology and Mineralogy**

Origin, age and interior of earth, earthquakes, volcanoes and mountains, weathering, geological work of rivers, wind, groundwater, glaciers, seas and oceans.

Definition of mineral, Classification of mineral into rock forming and ore forming minerals. Physical and optical properties of minerals, silicate structures, olivine family, feldspars, pyroxenes, amphiboles, micas, chlorides, garnets and quartz family.

### **Unit-2 Petrology, Structural Geology and Indian Geology**

Definition of rock, rock cycle, igneous rocks-forms, textures, structures, origin, classification and types. Sedimentary rocks- mode of formation, structures and textures, classification. Metamorphic rocks- Types and agents of metamorphism, structure and textures of metamorphic rocks – grades and zones of metamorphism.

Structural geology- strike and dip, folds, faults, joints and unconformities, recognition of folds in the field and recognition of faults in the field

Indian geology-Standard Geological time scale, Principles of correlation, Physiographical subdivisions of India. Achaeans, cuddapahs, vindyans, gondwanas, Deccan traps, siwaliks and recent formations.

### **Unit-3 Groundwater Geophysics**

Gravity methods: principles, instruments-survey techniques, Magnetic methods: principles, instruments, and survey techniques, Seismic method; principles, instruments, survey techniques.

Electrical methods: Wenner, Schlumberger, Lee, Dipole-Dipole configurations. Resistivity profiling and instruments. Resistivity sounding, Interpretation techniques. Geoelectrical parameters corresponding to hydrological zones, Application of resistivity in groundwater studies.

Electromagnetic methods: principles, instruments, survey techniques. Induced polarisation methods: principles, relationship between apparent chargeability and apparent resistivity.

EM sounding - profiling-dipole and VLF techniques. Bore hole geophysics: Well logging, basic concepts of logging.

### **Unit-4 Hydrochemistry**

The water molecule, isotopic composition of waters-physical and chemical properties of water, geochemical processes, geochemical classification of waters, Mechanisms controlling the groundwater chemistry.

Chemical dissolved constituents. Sampling of water from rivers, lakes, ponds, open wells, bore wells. Standard laboratory techniques for the analysis. Bacteriological studies. Interpretation of physical and chemical data of water, plotting on maps, Statistical techniques in presenting hydrochemical data.

### **Unit-5 Environmental Hydrology**

Ground water pollution- its sources and classification, Water sanitation- water borne diseases, Groundwater quality problems that originate above and below water table. Utility of water, for drinking, agriculture, industry and recreation. Standards of water- Indian, World Health Organisation,

Control measures of groundwater contamination, prediction of contaminants migration and travel times, problem of fluoride and arsenic. Defluorination-Nalgonda method, Activated carbon method of treatment.

Global threat-Elnino effect -Green House Effect-Ozone layer depletion and its impact on hydrological environment-Global Warming- acid rain- its cause and impact on water environment.

### **Unit-6 Surface Hydrology**

Hydrologic Cycle, Precipitation, Infiltration, run-off, Evaporation & Evapotranspiration, Water Balance Studies, Forecast of climatic Parameters.

The significance of water, Water resources of the earth. Global water budget. Formation of surface water resources; streams, rivers, lakes, swamps, caves, seas and oceans.

Runoff, groundwater runoff, direct runoff, factors affecting runoff. Discharge and discharge measurement, hydrographs: components of hydrograph, base flow separation methods. Unit hydrograph to design flood computation and of inflow to major rivers.

### **Unit-7 Groundwater Hydrology**

Groundwater in Hydrologic cycle, Occurrence of Groundwater: Aquifer, Aquiclude, Aquifuge and Aquitard, Porosity, Effective porosity, Vertical distribution of Groundwater; Zone of aeration, zone of saturation, Division of subsurface water. Specific retention, specific yield, Storage coefficient. Water movement in saturated soils, Darcy's law. Permeability, Intrinsic permeability. Hydraulic conductivity, Transmissivity, Determination of Hydraulic conductivity.

Groundwater fluctuations: Secular, Seasonal and Short-term fluctuations, Artificial Recharge of Groundwater, salt water intrusion of coastal aquifers, Development of Groundwater in intrusion areas.

Water wells: Dug wells, Bored wells, Driven wells, Jetted wells, Methods for drilling deep wells, Well design, Well completion, Well development, pumping equipment, Protection of wells, Well rehabilitation and Horizontal well.

### **Unit-8 Hydrologic Modeling**

Concepts of modelling, Process of model development, types of Hydrological models: Physical models and Mathematical models. Introduction to Continuous and Discrete models, Dynamic and Static, Lumped parameter and Distributed parameter models, Block-Box model, Conceptual model, Stochastic and Deterministic models

### **Unit-9 Watershed Management**

Watershed: Concept, Characteristics, Size, Shape, Physiography, Climate, Drainage, Land-use, Hydrological parameters. Basic data collection, Integrated Study of Watershed Management. Conditions to develop watershed, types of Watersheds, Integrated studies to develop watersheds. Rain water structures, design and Economic aspects. .

Floods: flood elevation, Flood discharge, flood volume and duration of floods, Flood estimation, causes of flood, factors affecting flood flow, flood flow determination flood control methods, limitations of flood control measures, Flood routing. Watershed and Agricultural Practices, National projects, Appropriate Technology and action plans, Post-operative problems of watersheds.

### **Unit-10 Remote Sensing and Geographical Information System**

Electromagnetic Energy: Laws, Distribution and Interaction, concept of incoming short wave and outgoing long wave radiation: passive and active remote sensing, electromagnetic radiation, spectral reflectance curves. Imaging and non-imaging sensors, resolution. Satellite remote sensing, geo-synchronous and sun-synchronous orbits, IRS-satellites and high resolution satellites. Supervised and unsupervised image classifications. Remote sensing applications for meteorological, hydrological, geological studies and urban planning and management.

Basic concepts of geographical information systems, map projections, geographic coordinate system, transformations, map analysis. Data Acquisition and Data Management, Data Processing, Data Modeling, GIS Analysis and Functions. GIS applications to Environmental and natural resource management, software scenario, functions, standard GIS packages.