

P. G. DIPLOMA IN WATERSHED TECHNOLOGY AND MANAGEMENT

2017-2018

Scheme of Examination

Theory Papers

Course	Title	Max. Marks
Course - I	Basic of Geology and geomorphology	100
Course - II	Surface Hydrology	100
Course - III	Ground water Hydrology & Exploration	100
Course - IV	Irrigation Management & Soil And Water conservation	100

		Total 400
<u>Laboratory Course - I</u>		
Group - A	Geomorphology, Surface Water Hydrology Ground water, Groundwater Exploration	75
Group – B	Irrigation Management & Soil and Water Conservation	75
<u>Field work</u>		50

		Total 200
	Grand Total	600

SYLLABUS

Course - I: Basics of Geology and Geomorphology

Unit-I

1. Earth as a member of Solar System. Atmosphere, lithosphere and hydrosphere. Surface features and internal structure of earth.
2. Minerals_ Definition and classification. Physical properties and chemical composition of rock forming minerals.
3. Rocks _ Definition and classification. Mineral composition and texture of important igneous and metamorphic rocks.

Unit- II

1. Texture and mineral composition of sedimentary rocks.
2. Definition and classification of economic minerals.
3. Brief idea about occurrence and distribution of Iron, Manganese, Copper, lead-zinc deposits, fossil fuels, and industrial minerals in India.

Unit- III

1. Concept of Bedding and Deformation in rocks. Elementary idea of attitudes of different structures. Deformational structures in rocks and their impact on groundwater movement.
2. Rock weathering and soil formation. Soil profile and important soil types of India.
3. Origin of Mountains. Earthquakes and Volcanoes. Volcanic landforms.

Unit- IV

1. Wave erosion and beach processes. Coastal landforms.
2. Erosion and deposition by winds. Aeolian landforms their characters and distribution in India.
3. Erosion and deposition by rivers. Characteristics of fluvial landforms.

Unit- V

1. Glacial landforms.
2. Karstification and Karst landforms.
3. Drainage patterns. Morphometric and hypsometric analysis of drainage basin. Watershed delineation.

Course II: Surface Hydrology

Unit-I

1. Hydrologic Cycle. Rainfall and its measurement. Characteristic rainfall in India. Rainfall probability and probable maximum precipitation (PMP).
2. Infiltration factors, infiltration curve and indices. Transpiration and Evaporation. Estimation of evaporation. Potential evapotranspiration. Water balance.
3. Run-off, stream flow. Factors affecting run off. Catchments characteristics, runoff estimation, classification of streams. Hydrographs: Hydrograph separation, unit hydrographs.

Unit- II

1. Surface water resources of India.
2. Reservoirs. Classification of reservoir. Significance of Earth fill, Rock fill and gravity dams.
3. Reservoir site selection and selection of dams. Siltation in Reservoirs – Problems and measures.

Unit -III

1. Losses from reservoir, impact on environment.
2. Hydrology of droughts, definition and types.
3. Combating of droughts.

Unit –IV

1. Floods: Causes of floods.
2. Flood controls: Flood control dams, detention basins, levees, diversion channels, and flood channel improvement schemes.
3. Water logging, causes and remedial measures.

Unit-V

1. Watershed: Definition, classification. Concept of watershed management, its importance and scope.
2. Watershed management plan development – Data and resource evaluation.
3. Methods and principles of Economic and Hydrogeological evaluation of watershed management work.

Course III: Ground water Hydrology and Exploration

Unit-I

1. Aquifer types and characteristics. Darcy's law and its validity. Steady and unsteady radial flow of ground water.
2. Aquifer performance test and step down test for determination for aquifer parameter and well loss (Thei's and Jacob's method). Analysis of pump test data.
3. Ground water estimation, conjunctive use of surface and groundwater Water table fluctuation, recharge and discharge. Geologic and geomorphic controls on groundwater

Unit-II

1. Inland salinity problem and saline fresh water interface. Groundwater provinces of India. National water policy.
2. Pollution of surface and groundwater, and its health hazards.
3. Preventive measures. Treatment technologies of contaminated water with special reference to fluoride and arsenic.

Unit-III

1. Introduction to geohydrological and geophysical methods of groundwater exploration.
2. Remote Sensing and Its application in hydrogeology
3. Techniques for resistivity method of exploration. Subsurface geophysical well logging.

Unit -IV

1. Well type and their construction in soils and hard rock areas.
2. Methods of drilling tube wells: Cable tools, hydraulic rotary, reverse rotary and DTH (Down The Hole).
3. Centrifugal and bore hole type pumps.

Unit -V

1. Development and rehabilitation of tube wells.
2. Groundwater development, specific yield, well interference.
3. Well performance, over draft. Groundwater budgeting

Course IV: Irrigation Management and Soil and water conservation

Unit -I

1. General irrigation development in India.
2. Historical review, modern trends.
3. Crop requirements and irrigation scheduling.

Unit -II

1. Major Indian crops, times of sowing and harvestings. Crop Selection.
2. Depth and frequency application of water irrigation schedules. Water use of efficiency, cropping patterns.
3. Water conveyance and application methods.

Unit -III

1. Lined and unlined canals, control and diversion structures in field channels and drains.
2. Underground pipe system.
3. Drip and sprinkler irrigation systems.

Unit-IV

1. Drainage: cause of water logging, design of surface and subsurface drains, saline and alkaline lands.
2. Reclamation and management of salt affected lands.

Unit-V

1. Soil and water conservation
2. Characterization and identification of watershed. Soil and water conservation practices. Geotechnical investigation and design of artificial recharge structures: Injection wells; Induced recharge structures, Pit/Trench and combination of structures, Safety analysis of recharge structures.
3. NGOs their functions and contributions in watershed management.

Practical

Group A:

1. Study of common igneous, sedimentary and metamorphic rocks in hand specimen. Their hydrologic properties.
2. Study of topographical maps: latitudes and longitudes, map reading- identification of surface topographic features on map. Scale and its representation. Delineation of watershed.
3. Preparation of profile.
4. Study of simple structural maps. Selection of dam sites.
5. Study of rainfall data and their interpretation.

Group B:

1. Preparation of water table contour maps and their interpretation.
2. Study of soil types.
3. Use of Water analysis Kit for determining pH, temperature, conductivity, dissolved oxygen etc, of water samples. Lab work for determining the quality of water.

Fieldwork:

Use of Clinometer or Brunton compass for locating of position on the map, use of GPS.
Determination of dip and strike of the strata and its plotting on the map.

Field study of drainage pattern and delineation of watershed.

Field visit for study of river deposits, terraces, gullies, soil erosion and other features.

Study of soil types.

Visit to well drilling site and artificial recharge structures: its description. Interaction with NGOs, their activities.
